The Association between Accruals, Economic Value Added, and Cash Value Added and the Market Performance of UK and US Firms

Ahmed Mushref Al-Omush

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DOCTOR OF PHILOSOPHY

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DECLARATION

This work has not been previously accepted in substance for any degree and is not being concurrently in candidature for any degree.

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Abstract

The main purpose of this thesis is to provide statistical evidence on the value relevance of a set of selected performance measures, to measure the performance of companies according to the traditional accrual measures and value added measures, and finally, to assess their information content and incremental information content. The study covers a sample of 986 UK companies listed in the London Stock Exchange (LSE) with an active share during the period 1990 to 2012.[1] This thesis also provides evidence on the long-term impact of adopting economic value added (EVA) by 89 US companies on a set of important firm decisions, namely, the investing, financing and operating decisions. The time horizon of this analysis spans the period 1960 -2012.

The empirical evidence indicates that all the performance measures used in this thesis have a significant association with stock prices and returns. In addition, the results also reveal that when applying the price model, cash flows from operation (CFO) has the highest explanatory power among the variables considered. The remaining performance measures regarding their value relevance are in the following order: earnings before interest, tax, depreciation and amortization (EBITDA), earnings before interest and tax (EBIT), net income (NI), earnings before extra ordinary items (EBEI), cash value added (CVA) and EVA. Furthermore, the results show that EBITDA dominates other variables when the return model is used.

With regard to the incremental information content, there is significant evidence of the existence of incremental information content between paired measures. The best combination was between CFO and EBITDA and the lowest exists when NI is paired with EBEI. Furthermore, this study provides empirical evidence on the incremental information content of EVA and NI components with regard to explaining the variation in the annual stock return.

The final task involves the examination of the adoption of EVA as a performance incentive scheme and management tool. The results show that EVA firms outperform their matching firms and the market portfolio S&P500 index. In addition, it is found that adopting EVA significantly affects the adopting firm's potential investing and financing and operating decisions. Several modifications to the model by Wallace (1997) are proposed. However, the results obtained regarding the long-term effects of EVA adoption are mixed regardless of the model applied. In particular, the new investment decision is the only one in the direction of Wallace (1997).

[1] The vast majority of the firms were from the Main Market (only 11 firms were from the Alternative Investment Market).

DEDICATION

This work is dedicated to my Mother's soul. She died in the middle of my writing-up stage, for her constant encouragement as I began this process- may her soul rest in peace.

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List of Abbreviations

ACC	Accruals
ΔC	Change in Cash and Short-term Marketable Securities
ΔAP	Changes in Accounts payable
ΔAR	Changes in Accounts Receivable
ΔINV	Changes in Inventory
ABC	Activity-Based Costing System
AcctAdj	Accounting adjustments
ADJ	Adjustments
AMORT	Amortisation
APV	Adjusted Present Value
AR	Abnormal Return
ATInt	After Tax Interest
BHAR	Buy and Hold Abnormal Return
BHR	Buy Hold Return
BV	Book Value
CA	Current Asset
CAI	Cash Flows After Investment
CAPCH	Capital Charge
CAPM	Capital Asset Pricing Method
CAR	Cumulative Abnormal Return
CC	Capital Charge
CEO	Chief Executive Officer

CFAI	Cash Flows after Investment
CFF	Cash Flows from Financing Activities
CFI	Cash Flows from Investing Activities
CFO	Cash Flows from Operations
CFS	Cash Flows Statement
CML	Capital Market Line
CVA	Cash Value Added
DCF	Discounted Cash Flows
DD	Dividends
DEP (DP)	Depreciation
E	Earnings
EARN	Earnings
EBDIT	Earnings Before Depreciation, Interest and Tax
EBEI	Earnings Before Extraordinary Items
EBIT	Earnings Before Interest and Tax
EBITDA	Earnings Before Interest Tax Depreciation and Amortization
EBO	Edward-Bell-Ohlson Model
ECF	Equity Cash Flows Method
ED	Economic Depreciation
EP	Economic Profit
EPS	Earnings per Share
EVA	Economic Value Added
FASB	Financial Accounting Standards Board
FCF	Free Cash Flows Method

FEM	Fixed Effects Model
FIFO	First in First out Inventory Evaluation Method
FRS	Financial Report Standards
GAAP	General Accepted Accounting Principles
I	Interest
IAS	International Accounting Standards
IASB	International Accounting Standard Board
IC	Invested Capital
IFC	International Financial Corporation
IFRS	International Financial Reporting Standard
IPO	Initial Public Offering
LIFO	Last in First out Inventory Evaluation Method
LIM	Linear Information Model
LSE	London Stock Exchange
LSPD	London Share Price Database
M	Materials and Services Purchased
MAR	Annual Stock Returns
MV	Market Value
MVA	Market Value Added
MVE	Market Value of Equity
NCA	Nun-Current Asset
NCF	Net Cash Flows
NI	Net Income
NIBIE	Net Income Before Extra-Ordinary Items and Discontinued Operations plus Depreciation

NIDPR	Net Income plus Depreciation and Amortisation
NOPAT	Net Operating Profit after Tax
NPV	Net Present Value
NVA	Net Value Added
OCFD	Operating Cash Flows Demand
OI	Operating Income
OIADJ	Operating Income Adjustment
OLS	Ordinary Least Squares
OM1	Ohlson Model One
OM2	Ohlson Model Two
OP	Operating Profit
OCF	Cash Flows From Operations
OTHER	Other Accruals
PER	Price-Earnings Ratio
RE	Retained Earnings
REVA	Refined Economic Value Added
RI	Residual Income
RIM	Residual Income Method
ROA	Return on Assets
ROE	Return on Equity
ROI	Return on Investment
ROS	Return on Sales
S	Sales
STSTADJ	Stern Stewart Adjustments

T	Tax
TA	Total Assets
UCAI	Unexpected Cash Flows After Investment
VA	Value Added
VBM	Value Based Measures
W	Wages
WACC	Weighted Average Cost of Capital
WCFO	Working Capital from Operations
WCO	Working Capital of Operations

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Chapter 1
Introduction

1.1 Background

The measurement of a firm's performance is a crucial issue to its stakeholders, especially its shareholders, directors, managers and debtors. Changes in a firm's performance can be detrimental to its health, its profitability and ultimately its survival. The concept of maximizing shareholder wealth has been one of the driving forces in the change in current management practice. This is the wealth that is traditionally gauged by either a standard accounting magnitude such as profits, earnings and cash flow from operations or various financial statement ratios (e.g. earnings per share, returns on assets, and investment and equity). Managers, shareholders and other interested parties then use this financial statement information to assess and predict current and future performance.

Over the past decades, considerable attention has been paid to the relationship between accounting numbers and firm value. This attention to the relationship between theoretical firm value and the performance stream has attracted considerable researcher interest and resulted in a number of proprietary models being introduced. Ball and Brown's research in 1968 was the first to discuss the information content of accounting numbers. They measured the association between annual earnings (cash flows from operations) and the abnormal return using the operating earnings as proxy for operating cash flows and they reported that earnings showed a higher correlation with abnormal stock return than cash flows.

The work of Ball and Brown was replicated by sequences of empirical research using various proxies for annual earnings (i.e. Beaver, 1968; Beaver and Dukes 1972; and Pattel and Kaplan, 1977) to investigate the association between these performance measures and the variation in the stock price (return). Unfortunately, the results regarding the relevancy of the investigated measures are contradictory. This contradiction in the result obtained by different market-based accounting research and the criticisms which have arisen against the accruals (e.g. subjectivity and easily manipulated), and the main components of traditional measures, means that increasing attention has been paid to new financial performance measures as substitutes for traditional accounting-based measures.

However, after the cash flow statements gained the attention of the International Accounting Standard Board (IASB) more studies have been conducted to examine the incremental information content of cash flows over earnings (Finger, 1994; Clubb, 1995; Barth *et. al*, 2001). These studies concluded that cash flows have information content, but they reported mixed results regarding the incremental information content of cash flows over earnings. However, these studies did not attempt to investigate the role of aggregate accruals.

As there are no conclusive results regarding the usefulness of earnings and cash flow items, neither the accrual earnings, nor the cash flow items, were perfect methods for measuring management performance as an approach to evaluating the whole firm (shareholder wealth) (Bowen *et al*., 1987; Charitou *et al*., 2001). Nevertheless the bulk of empirical evidence indicates that the superiority of cash flow measures versus earnings (as variously defined) has not been demonstrated.

Management decisions – particularly the investment, financing, and operating decisions – affect shareholder value through their influence on such value drivers as value growth duration profit margin for the cash flows from operations or the cost of capital. The criterion has long persisted that in order for a company to create value and to generate wealth it must earn more than it costs (cost of capital employed) by way of debt and equity. The added value concept has been promoted strongly in performance measurement literature. This notion is historically referred to as the residual income (RI) method (a value added measure).

A long glance at the late 80s and early 90s, the dates when EVA spread widely among firms, will enable the reader to attribute this diffusion to at least two factors. First, there are the criticisms the traditional accounting measures faced as a result of their subjectivity, depreciation methods, and inventory valuation (i.e., FIFO and LIFO techniques). As a consequence, these measures can be easily manipulated by managers and this will affect the profitability analysis. Second, financial markets went global and experienced huge expansion. At the same time US firms found themselves competing with foreign companies for a share of the market and faced tough competition from other firms especially the Japanese. These factors imply that previous performance measures that shareholders used over a long period to guide and evaluate their investments are inefficient. This is a sufficient reason for shareholders and investors to contemplate other performance metrics, ones which may be objective and not manipulated. The best known example (at least from an EVA supporter's viewpoint) is perhaps the developed version of the residual income method: the Economic Value Added or EVA model of Stern Stewart (1991).

EVA, as a periodic performance measure, was introduced by Stern and Stewart to replace earnings and cash flows from operations as a measure of performance. Stewart (1994, p.75) argued that 'EVA stands well out from the crowd as the single best measure of value creation on a continuous basis'. In addition to this he also remarks that 'EVA is almost 50% better than its closest accounting-based competitor (i.e. earnings), in explaining changes in shareholder wealth' (p.75). EVA is defined as the profit earned by the firm less the cost of financing the firm's capital. It is similar to RI but adjusted for net operating profit after tax (NOPAT) and invested capital where needed. It is also referred to as net operating profits less a charge for the opportunity cost of invested capital (West and Worthington, 2000).

Scholars have different points of view regarding the usefulness of economic value added (EVA) measures in explaining the variation of stock price performance. Thus as seen to date, the literature provides several studies questioning the claimed superiority of EVA to earnings and other performance metrics. Biddle *et al.*, (1997) claim that both earnings before interest and tax (EBIT), and the residual income (RI) have the higher adjusted R^2 and outperform EVA in explaining variation in stock performances. Similarly, Lehn and Makhija (1997) argue that in spite of it having a higher correlation with stock return among the other performance measures, EVA and market value added (MVA) are not the most efficient metrics to evaluate a firm's performance. Cahan *et al.*, (2002) contend that EVA is the best reward system as it better aligns the interests of the manager and the firm. Furthermore, Anastassis and Kyriazis, 2007 assumed that the value of EVA correlates better with market value (MV) than other accounting variables. Recently, Mehdi and Iman (2011) investigated the relative and incremental information content of EVA over traditional measures. They stated that stock return is highly associated with return on assets (ROA), return on equity (ROE), and earnings per share (EPS), while EVA appears to have little information content beyond that which exists in other traditional accounting measures. Hence, the results do not support Stern and

Stewart's claims that EVA is the only metric that best measures firms' and manager performance.

However, as a result of the criticisms the traditional and value added measures have faced, particularly the earnings and economic value added (EVA). And also in response to the arguments rose by Young (1999) towards the Stern and Stewart adjustment. The adjustment that mainly intends to produce a modified version of the EVA measure that probably has the ability to mitigate the drawbacks of accrual based measures and in its essence is similar to cash flows measure, researchers have begun to rethink new performance measures that can better capture the performance of firms and managers.

In response, Ottosson and Wiessenrider (1996) proposed a new performance measure titled, cash value added (CVA)[2] to replace the traditional accounting and value added measures, specifically the periodic measure EVA. They defined CVA as the difference between operating cash flows (OCF) and operating cash flows demand (OCFD). The first component basically represents the earnings before depreciation, interest and tax (EBDIT) adjusted for non-cash charges, working capital movements and non-strategic investments. The second component refers to investors' capital cost, which is mainly the interest and dividends.

However, an empirical question arises here. Which measure has the better association with the stock return/ price? Unfortunately, the empirical literature to date suggests that there is no single accounting based measure upon which one can rely to explain changes in shareholder wealth.

The question that has received much concern in market-based accounting research is the relative information content of alternative performance measures (e. g. EVA, CVA, earnings, EBITDA, and cash flows). In evaluating various performance metrics, the criterion used must take into consideration the objective of a particular performance measure (Kothari, 2001). An important purpose of cash flow statements is that cash flow data are helpful in assessing the amount, timing, and uncertainty of future cash flows.

[2] This is a trademarked performance measure that was developed by the global management consultant 'Boston Consulting Group (BCG)' a U.S company founded in 1963 and which came to prominence in 1973.

The majority of prior empirical studies have used the association with share price or stock return as the criterion to evaluate the different performance measures. Implicitly, the main assumption of share price studies is that in an efficient market, share prices reflect information about expected future cash flows (future benefits). However, this assumption has been challenged by market "anomalies". For instance, the results of Sloan (1996) indicate that investors appear to focus on earnings and investors were incapable of considering the differential persistence of their cash flows and accruals components. Thus, there is the opportunity that the share-price studies' results may be affected by the possibility that the market is concentrating on bottom line earnings (the market is not efficient). In this context, Bernard (1995) described the limitation of share-price studies: "Preclude from the outset the possibility that researchers could ever discover something that was not already known by the market" (p. 735).

The value-relevance studies that investigate the empirical relation between stock market values, changes in values and different accounting numbers are important disciplines for accountant research. The price and return models are the most popular valuation methods in accounting literature (Barth *et al.*, 2001). According to Christie (1987) both models are economically equivalent since they were derived from the same source which is the linear information model introduced by Ohlson (1995). This implies that the main inferences drawn from the two approaches should be the same- at least at the theoretical level.

In practice, Kothari and Zimmerman (1995) claimed that even the return model suffers fewer econometric problems than the price model where the estimations of earning response coefficients are more biased than those of the price model. Barth *et al.* (2001) found that when stock return is the dependent variable, earnings are better than cash flows but when actual future cash flows is the dependent variable, cash flows turn out to be better than earnings in explaining the variation in future cash flows. Thus, providing evidence on the value relevance of different performance measures using only the stock-return model is not enough to judge the usefulness of performance measures other than earnings. There are many UK studies which had as their aim the comparison of various performance measures on the basis of their association with stock return. However, there has been no attempt to compare the different performance metrics on the basis of their association with annual stock prices. Therefore, this study will try to bridge this gap by investigating the association of different sets of performance measures with the variation in stock price performances. These performance measures are net income available to common shareholders (NI), earnings before interest, tax, depreciation and amortization (EBITDA), earnings before interest and tax (EBIT), earnings before extraordinary items (EBEI), net cash flows from operations (CFO), cash value added (CVA) and economic value added (EVA).

1.2 Motivation of the Study

Each time researchers investigate the association between different performance measures and the stock price (return) they arrive at different points of view regarding the superiority and ability of these metrics in explaining the variations of stock price (return) performances. However, they fell through because they could not assign the optimal and perfect accounting measure that better gauges the performances of firms and executive management (Lehn and Makhija, 1997; Barton *et al*, 2010).

Lee (1996, p. 32), for example, argues that 'the search for a superior measure of firm valuation is a, if not the, key feature of contemporary empirical finance: For years, investors and corporate managers have been seeking a timely and reliable measurement of shareholders' wealth. With such a measure, investors could spot over or underpriced stocks, lenders could gauge the security of their loans and managers could monitor the profitability of their factories, divisions and firms'.

This relation between firm value and stock price return has been the focus of voluminous empirical research for the past three decades. A primary motivation for this research is to bridge an important gap in the UK literature relating to the information and incremental information content of a set of chosen accounting performance measures. While prior UK evidence (Board *et al*., 1989; Board and Day, 1989) is drawn from return studies in which stock return is the main criterion in evaluating the value relevance of accounting data, there are at present no UK stock price studies that measure the information and incremental information content of accounting measures by examining their ability to explain the variation in stock price performances. Econometrically, the two evolutionary methods, price and return evaluation methods, are different. Economically they are equivalent since they are derived from the same source which is the linear information model (Ohslon, 1995). However, Rees (1999) explains in his paper that there are some difficulties that can be expected in the return model and these problems can be avoided by using the price models.

Another powerful motivation for this research is that it intends to be the first research that utilises UK data to examine the value relevance of the new residual income method: the cash value added (CVA), a title coined by the Boston consulting group, to provide evidence on its ability to outperform other performance measures, namely the economic value and traditional accounting metrics.

1.3 Purpose of the Research

The main objectives of the study are:

- To empirically investigate the association between a comprehensive set of performance measures and the stock price (return) performances to indicate which of these measures are better at explaining the variation in stock performance and have the ability to evaluate the management performances and the whole company performances. These measures are the traditional accounting measures: net income (NI); earnings before interest, tax, depreciation and amortization (EBITDA); and earnings before extraordinary items (EBEI). There is also the cash flows measure: cash flows from operation (CFO), the value added measures (residual income method) economic value added (EVA), and cash value added (CVA). This is achieved by employing a fixed effects model and running six regressions against the selected metrics. The dependent variable is the three month closing stock price following the reporting day and stock return respectively. The set of independent variables is constructed from the review of extant literature.

- To empirically examine the incremental information content of the selected set of performance measures.

- To extend previous studies by decomposing the primary measure, namely earnings and economic value added EVA, into their main components to test whether these components contribute more to the association of the prime measure with the stock (price) return.

- To utilise the event study methodology to examine the impact of adopting EVA as a compensation plan and management tool on the performance of US firms after the adoption date. The BHAR and CAAR are the aggregation methods used. This includes comparing the performance of event firms to that of both the matching firms and benchmark portfolio index, the S&P500.

- To extend the work of Wallace (1997) by proposing three econometric models to investigate the long-terms effects of EVA adoption on US firms' material decisions. These are the investing, financing and operating decisions which it is claimed would increase the value of the company.

1.4 Contribution of the Study

This research will contribute to prior UK studies in three major respects:

I. Unlike previous research, it will employ UK data for the selected period and adopt a unified econometrics model to examine and test the association of a set of performance measures, being the focus of past literature, and the variation in annual stock price performances. From the research point of view, this will eliminate the controversies embedded in the findings of previous UK and US studies regarding the use of different samples and econometric models to conduct their research (Garrod *et al.,* 2000). Furthermore, this research will extend its goal to test for the incremental information content of earnings and EVA main components and examine whether any of these components has a greater contribution to the association between the prime performance measures and annual price performance.

II. As Rees (1999) explained in his paper, there are some difficulties to be expected in the return model and these problems can be avoided by using the price models. Hence, the stock price has become the most common value-measure used in financial and accounting research. This research will use both the stock price and the return as dependent variables instead of using the stock return alone.

III. In response to the adjustments Stern and Stewart applied to NOPAT and the capital employed, the main figures need to compute EVA, which aims to produce a performance measure that is equivalent to cash flows and less subject to the distortions of accrual accounting (Young, 1999). This research will contribute and enhance the theoretical aspect of the research with a broad empirical study of UK literature by using cash value added (CVA) as an alternative performance measure (initially proposed by Ottosson and Weissenrieder, 1997) and investigate its association with annual stock price performance and test whether CVA contains more information content than other performance measures.

IV. It will extend the work of Wallace (1997) by introducing three alternative models that the current research expect will more effectively capture the long term effects of adopting EVA as a compensation and management tool by different US firms.

1.5 Scope of the Research

The current research uses the empirical approach to fulfil its aims. The sources of data are DataStream, CRSP and Compustat. The data drawn from UK industrial companies will be used to run the empirical test. This study will cover the period from 1990 to 2012.

Furthermore, in order to empirically test the impacts of adopting the EVA compensation scheme on the treatment companies' potential investment, a sample of 89 US firms over the period from 1960 to 2012 were selected. The sources of data are Compustat and CRSP.

1.6 Research Structure

Apart from this introductory chapter the thesis is organized into six main chapters:

Chapter Two presents the literature review of different performance measures and their association with stock price (return) performances and introduces the literature review concerning the explanatory variables which will be examined in the current research and provide a historical look at the debates these measures have encountered. This chapter is also devoted to the discussion of certain economic theories in terms of its relation to the topic under investigation. These are the compensation theory, the information content theory and the incremental information content theory. Finally, this research will discuss and review the literature which has already been conducted in terms of the association between traditional measures, cash flows and value added measures and variations in stock price (return) performances.

Chapter Three discusses the research methodology commencing with the review of the research design which included identifying the hypothesis development process and then addressing the research questions which follow the review of the literature. Following this the models adopted in the research will be introduced. These are the price model and the return model. The final part looks at the hypotheses of the research. The research methodology chapter discusses the main research variables, including their definitions and calculation.

The sample frame, the sample size, and the controlling variables are also discussed. In addition, the chapter discusses the procedures of measuring and ascertaining the reliability and relevancy of research variables. Finally, the chapter briefly discusses the statistical analyses tests that will be used in the research and which are explained in-depth in the next chapter.

Chapter Four develops tests for the hypotheses developed in Chapter Three and reports on the main body of results for the study. The value relevancy and incremental information content of performance measures will be evaluated by assessing their ability in explaining the variation in stock performances.

The results for the fixed effects models are reported in this chapter. These results provide evidence on the relative ability of net income (NI) versus the cash flows and accrual components and the relative information content of Economic value added (EVA) versus cash flows, accruals and other components.

Chapter Five describes the research design and the methodology that was used to examine the EVA adoption event. It provides a historical look at the event study literature and discusses and reviews the literature which has already been examined in terms of the implications on firm value of firms adopting EVA as a performance and management tool. The sample selection process and, the sample size are discussed as well. The models which will be used in the research are then introduced. The CAR and the BHAR aggregation approaches are used to conduct the event study test. Furthermore it sheds light on the statistical properties of returns, abnormal returns and aggregate abnormal returns, BHAR and CAR, and the empirical results obtained.

Chapter Six extends the empirical test begun in chapter five. It replicates the same model applied by Wallace (1997). Three modifications were proposed to extend the original work of Wallace**.** First it is modified by introducing the market return index (S&P500) as a control variable to replace the change in ownership in Wallace's original model. Second, a model is proposed that uses levels rather than differences. Third, a modified model is proposed that uses abnormal measures of dependent and independent variables**.** It then describes the sources of data and the collection process in terms of the set of variables used. Empirically, it tests the effects of adopting EVA on firms' potential decisions taken to maximize the shareholders wealth, namely the investment, financing and operating decisions.

Chapter Seven provides the main findings of the research, draws conclusions, research contributions and implications, and indicates the research recommendations based on the findings and conclusions. In addition, the chapter highlights the research limitations and provides suggestions for future research.

Chapter 2
Literature Review

2.1 Introduction

The delegation of management from investors to executive managers is one of the most important agency relationships in finance. Typically, the literature focuses on joint stock corporations with a large number of shareholders who delegate power to managers. These managers effectively control the company. Understandably, the appropriate compensation for these managers is an important topic of debate among practitioners and academics. On the other hand, there has been increasing pressure on managers to maximise shareholders' wealth (Sharma, 2010).

The evaluation of a company's performance is considered one of the most important challenges to researchers (Kaplan and Norton, 1992). This issue is becoming increasingly important to shareholders, and has been the subject of heated debates. To foster shareholders' interest, managers adopt strategies to increase the value of their organisation, which leads to maximising shareholder wealth through the optimum allocation of resources. In order to assess whether managers are performing well, researchers and practitioners need to use appropriate measurements. Scholars have developed specific criteria relating to the validity, relevance, accountability, and globalism of the performance measure(s) that are used to assess managers' or companies' performance (Rappaport, 1986). Unfortunately, there is no general agreement as to which criterion is most suitable and accurate as far as the evaluation of the managers' performance is concerned.

Rappaport argues that for any performance measure to succeed, certain fundamental criteria should be met; the first and most important criterion being its validity. The concern here is to show whether the inspected firms adopt the accepted accounting standards prescribed by the various standard setting bodies such as the International Accounting Standard Board (IASB) and its predecessor The International Accounting Standard Committee (IASC); and the extent to which they comply with them. Second, the performance measure should be verifiable. Hence, the adoption of any set of accounting standards will force accountants to follow the same procedures in accounting processes and that should lead to unbiased accounting numbers and support the validity of the released accounting information used later by various parties to assess the firm. Third, the selected performance measure should preserve accountability. This means that managers and executives will be responsible for those activities and investment decisions they have control over. The fourth criterion is the globalisation of the performance measure. The idea is that a firm does not work in isolation from other firms in the same industry or manufacturing segment. Consequently the performance measure should be able to maintain comparability between competitive firms within the same industry. Finally, the performance measure should be easily understandable by internal and external parties. It should be understood by the managers that the endorsement and selection of any performance measure means it will be used later to assess their performances (Bouckaret *et al.*, 2010).

Generally, any research design that aims to evaluate a firm's performance should adopt a valuation model that provides a better link between the firm's value and the firm's specific characteristics. Of particular importance is the link between a firm's value and accounting figures. Researchers have used a wide diversity of valuation models, ranging from the very simple to the most sophisticated (Ball and Brown, 1968; Patell and Kaplan, 1977; Dechow, 1994, and Biddle *et al.*, 1997). The main valuation models can be classified into four groups as shown in Table 2.1: balance sheet based (book value of equity); income statement based; value creation methods; and options (Fernandez, 2002). Obviously, there are practical considerations, such as the availability of information that may constrain the decision maker's choice of performance measurement method.

The balance sheet methods basically assumed that the value of a company lies in its balance sheet. These methods seek to determine the company's value by estimating the value of its assets. Some of these methods are the book value method in which the value of the company is equivalent to its shareholder' historical cost as presented in the balance sheet statement. This method suffers from the subjectivity shortage that is inherent in accounting procedures used to determine the value of balance sheet items (Ohlson, 1995). Thus, the adjusted book value method tries to overcome this shortage by evaluating the company's assets and liabilities using the current market prices.

Table 2.1 Main Valuation Methods

Balance sheet	Income statement	Mixed (Goodwill)	Discounted Cash flows	Value creation	Options
Book value	Multiples	Classic valuation	Free cash flows	EVA	Black & Scholes
Adjusted book value	PER	Union of European accounting Experts	Equity cash flows	Economi c profit	Investment option
	Sales		Dividends	CVA	Expand projects
Liquidation value	P/EBITD A	Abbreviated income	Capital cash flows		Delay the investment
Substantial value	Other multiples	Others	APV	CFROI	Alternative uses

Multiples: Multiplying production capacity (sales) by a ratio
EVA: Economic value added
PER: price-earnings ratio
CVA: Cash value added
P/EBITDA: Price per earnings before interest, tax, and depreciation and amortization
APV: Adjusted present value
CFROI: Cash flows return on investment

Source: Demirakos, Strong and Walker (2004), Fernandez, 2002.

Unlike the adjusted book value the liquidation method represents the value of a company when its assets are sold in the market and all of its debts are paid off. Finally, the substantial value method represents the replacement value which is defined as the amount of money an identical firm needs to invest in order to establish a company that is similar to the company being valued.

Similarly, the income statement methods are based solely on income statement figures (revenue, earnings, and other indicators) to evaluate companies. The common and simplest method of valuation is the value of earnings in which the company value is equal to the amount earned by multiplying net income (NI) by the price-earnings ratio (P/E ratio). Another method of evaluation is the value of dividend (the regular cash received by shareholder) in which the equity value is the net present value of the dividends share holder expect to obtain (Francis *et al.*, 2000). In addition to the price earnings ratio (PER), some of the frequently used multipliers are: price/sales ratio, price/EBITDA, and the value of the company/operating cash flows, the market situation is the main criterion to choose between these different multipliers.

A third method of valuation is the goodwill approach which is the one that seeks to value the company's intangible assets which often do not appear on the balance sheet

(Ohlson, 1995). However, this method can be classified as follows: (i) the classical method in which the company's value is equal to its net assets plus the value of goodwill, (ii) abbreviated income method where the firm's value is equal to the firm adjusted net worth plus the value of goodwill, and (iii) the Union of European accounting expert method (UEC) where the company's total value is equal to its net assets plus the goodwill which, in turn, equals the excess of the cost of an acquired firm over the net values set to assets acquired and liabilities assumed[3].

Another way to evaluate companies is the cash flow discounted-based method in which a firm's value is determined by estimating future cash flows the company will generate in the future and then discounting at a proper discount rate that takes into account the risk and historic volatilities of future cash flows (Penman, 2001). According to this method a firm's future cash flows can be obtained by different methods, starting with the free cash flow (FCF) which refers to the cash flow the company generates from operations without taking into account financial debt and capital expenditures. Closely related is the equity cash flow method (ECF) which is calculated by deducting the after tax interest and principle paid to the debtors from the FCF and adding new debt provided to the company. Thus, the capital cash flow method defines the future cash flow as the sum of debt cash flow plus equity cash flow (Penman).

The fifth evaluation method, which is discussed in-depth in the current chapter, is the value creation method that takes into their consideration the cost of capital used to generate profit. These methods are: economic value added (EVA), cash value added (CVA). All of these measures will be discussed later in this chapter.

Finally there is the real options method, the option that only exists when there are future possibilities for action. There are different types of option: expanding option when the company intended to expand its production facilities, and delay option depending on the market's future growth. Usually the net present values (NPV) were used to evaluate these options. Basically, Black and Schole's formula[4] is the proper method to value the financial option in which the value of a call on a share, with an exercise price K and which can be exercised at time t, is the present value of its price at time t. The main assumption of this formula is that the option can be replicated (El Karoui *et al.*, 1998).

[3] As mentioned in IFRS3.

[4] An equation to value call and put option, named after its developers, Fischer Black and Myron Sholes.

The measurement of a firm's performance is a crucial issue to its stakeholders, especially its shareholders, directors, managers and debtors. Changes in a firm's performance can be detrimental to its health, its profitability and ultimately its survival (Francis *et al.,* 2003). Thus, valuation methods are tools that help identify the sources of economic value creation and destruction within the specific company (Fernandez, 2002).

For many decades accounting earnings, the accrual performance measure, had been the most popular approach to evaluate management performance. This seems to have been superseded by evaluation models based on cash flow items (Board and Day, 1989). Earnings, a traditional performance measure, has come under increasing attack over the past few years because it relies heavily on historical cost concepts and ignores the cost capital (Mehdi and Iman, 2011), and as an alternative, performance measures that take into account the cost of capital and are used to generate value have received more attention (Garvey and Milbouran, 2000; Stewart, 1991). This has encouraged researchers to examine whether the residual income method and the value added method are superior to, and more reliable than, traditional methods (Dechow *et al.*, 1999; Rajan, 2000; Francis *et al.*, 2003). This debate will be discussed in detail in the next section.

This chapter begins by highlighting, in Section 2.2, the main theories that have been developed to explain the value relevance of accounting numbers. We also shed light on the appropriate characteristics of a good performance measure. Section 2.3 will discuss the main results of previous studies that have investigated the value relevance of different performance measures and the association between traditional and value based performance measures with annual stock price and return. Finally Section 2.4 summarises the chapter.

2.2 Theory of Performance Measures

The use of optimal performance measures has received much attention in accounting and finance, but there is still no consensus regarding the appropriate specification. In the accounting literature, the relationship between a firm's accounting numbers and its value is typically investigated using a number of different valuation models (Barth *et al.*, 2001). Price and return are the most widely used proxies for value nowadays.

2.2.1 Theory of Compensation

Managers' interests, in some situations, are different from those of the company's shareholders. Furthermore, managers sometime conduct work operations and activities in a manner that benefits their own interests, especially when their remuneration scheme is linked to current earnings (short-run compensation schemes). One of the best ways of inducing top management to adopt shareholder orientation is through a compensation system tied to the shareholder value creation (Rappaport, 1986). Indeed, "the theory of market economy is, after all, based in the individuals promoting their self interest via market transaction to bring about an efficient allocation of resource" (Rappaport, p.3).

The split between the firm's ownership and the firm's management gives rise to a variety of "principal-agent" relationship (Berle and Means, 1932). Theoretically, shareholders, as owners of the firm, have a claim on the firm's generated income even if they do not run their firm by themselves. For example, investors or financiers (principals) hire managers (agents) to operate the firm on their behalf as they need managers (specialized human capital) to generate profit on their investments, and managers may need the investors' funds since they may not have enough capital of their own to invest.

Agency theory reflects the conflict of interest between varying contracting parties and resource holders. It is concerned with so-called agency conflicts of interest between firm managers as agents and shareholders (principals), and the conflict between debt-holders and stockholders (Jensen and Meckling, 1976). The voluminous agency theory literature has produced (theoretically and empirically) several dimensions in explaining the essence of agency conflicts and outlining a framework of the basic agency problem between managers and shareholders. The agency relationship according to Jensen and Meckling (1976: p308) is "a contract under which one or more persons (the principals) engage another person (the agent) to perform some service on their behalf, which involves delegating some decision making authority to the agent". However, if both the agent and the principal have different desires or interests and prefer different actions, the agency problem will occur as the agents will always act in the best of their own interest and not the interests of the principal. Because while the costs are borne by owners (lower profit) the benefits of profit are enjoyed by managers, managers might select decisions that would be more important from the owners' point of view.

Furthermore, when an agency relationship exists, it also tends to give rise to agency costs, which, as any other costs, reflects the value loss to shareholders, arising from divergences of desires between shareholders and corporate managers. Overall, the agency cost's main components are the monitoring costs, bonding costs, residual loss and any other expenses the firm has to incur in order to maintain an effective agency relationship to promote managers to act in favour of the shareholders' interests (Jensen and Meckling, 1976). Theoretically, there are more than one fundamental ways the owners able to take in order to mitigate the agency problem. According to Jensen and Meckling, the principal can restrict divergences from his interest by establishing appropriate incentive schemes for the agent and paying monitoring costs designed to limit the aberrant activities of the agent. In other words, a firm (owners) has to control and monitor managers' performance (behaviour) and reward them based upon the performance they achieved. However, these methods are effective only if the key actions taken by managers can be easily observed by shareholders; it is costly and a hard task for the shareholder to verify what the managers are actually doing or whether the managers have been behaved in proper way as assumed to be (Eisenhardt, 1989).

The key elements of agency theory lie on a set of mechanisms, called corporate governance, adopted by a firm to minimize the inherent problems of agency. Corporate governance has traditionally been associated with the agency problem and developed many corporate governance mechanisms which, in turn, determine the effectiveness with which the owner deals with the agency problem and encourages managers to act in the shareholders' best interests. These mechanisms involve constraints, incentives and punishments. The area of executive compensation has mainly laid on agency theory as it focuses on the situation where a single owner (or principal) designs the optimal incentive contract and offers it to the manager of his or her firm (his or her agent) on a take-it-or-leave-it basis (Holmstrom and Milgrom, 1987). Alternatively, the literature of the agency theory offers a variety of solutions, such as monitoring by both the large shareholders and block-holders (Sloof and Praag, 2008), monitoring by debt holders (John *et al.*, 2010), monitoring by managerial ownership (inside ownership), monitoring by the board of directors and their role in structuring the incentive compensations contract (Jensen, 1983 and Datar *et al*., 2001), shareholder rights and takeover of the firm, the regulation (Cooper, 2009), and auditor and institutional investors (Wright *et al.*, 2002).

Compensation is considered one of the most material cost categories in most organisations. The efficiency with which this amount of compensation is allocated to different executive managers and targeted employees will enhance the firm performances and is likely to have a favourable impact on organisational behaviour (Gomez *et al*., 2010). The critical question that has raised much concern is how the use of compensation influences the behaviour of employees and decision makers, and what would the implications be for a firm's performance (Gomez-Mejia *et al.*, 2010). Traditionally, compensation, as an academic topic has attracted the interest of both social psychology (motivation theories) and labour economics (labour market) (Gomez *et al*).

The relationship between compensation and performance measures has been studied for a long time (Stewart, 1989). As a result of the way incentive schemes affect value creation within firms, many researchers (Stewart, 1991, 1994) target the heart of management motivation with performance evaluation and compensation schemes that are central to the value creation process. They contend that the most direct means of linking management's interests with those of shareholders is to design a compensation system where the incentive portion is based on the market returns that shareholders realise.

Closely related to the last point regarding a revised managerial compensation plan and an amended internal benchmark for corporate performance, are material assumptions for implementing Stern and Stewart's compensation system. In this context, Lehn and Makhija (1997) enrich this debate by raising the question as to which performance measure best predicts the performance of executive officers (CEOs). They claim that even though EVA appears to be a considerably more reliable indicator of CEO turnover than traditional measures, EVA and MVA are not the relevant criteria.

From a different point of view, Rogerson (1997) investigates the relationship between managerial investment incentives and the alternative allocation methods applied to the cost of investment over the operating periods during which the benefits from these investment decisions arise. Moreover, he contends that as managerial compensation schemes in most companies are based on some accounting measure of income, the allocation method that treats the cost of investment will have a number of effects on the compensation incentive. A question which has arisen previously, regarding the conflicts between managers' and shareholders' interests, is whether managers' private incentives (moral hazards) will lead them to choose those efficient investments that meet the shareholder perspective.

Rogerson (1997) concludes that among the many alternative evaluation methods used to allocate the cost of investment, the preferred approach that best allocates the cost of investment and helps managers to choose the most efficient level of investment is the adoption of the developed version of the residual income method (RI), the economic value added EVA as a performance measure.

The concept of pay-for-performance is widely accepted by board members, top management, compensation consultants, and stockholders (Jensen and Murphy, 1999). However, firms may achieve their goals but at the same time suffer from declining stock values which can be easily recognised as a mismatch between performance evaluation and the measurement standards employed in the planning system. This lack of association between shareholder returns and the compensation system has triggered heated debate as to whether the performance measures adopted by the existing compensation programmes motivate executives to adopt strategies that create economic value for the shareholder.

In a related work, Gomez-Mejia *et al.,* (2010) argue that when performance is used as a basis to distribute rewards, payment is provided for individual or group contributions to the firm's value. "In general, a focus on performance to distribute rewards is most appropriate when the organization's culture and national or regional cultures emphasise a performance ethos, competition among individuals and groups is encouraged" (p. 27).

Consistent with the above premise, a number of empirical studies (Wallace, 1997, 1998: Kleiman 1999: Sharma and Kumar, 2010) investigated whether the inclusion of traditional performance measures or new value-based measures such as the residual income method (implicitly EVA) would add efficiency and reliability to the compensation systems adopted and tried to show how to combine stock prices with other performance measures (at least two) to produce an optimal compensation scheme.

Closely related to the last point, EVA has been the focus of two empirical studies carried out by Wallace (1997, 1998). Wallace's (1997) study is considered a major work that addressed the changes in profitability a firm achieves when adopting EVA. He investigated whether the use of value added, EVA or residual income bonus plans led to the making of decisions consistent with the economic incentives embedded in those plans. His findings are consistent with what Sharma and Kumar (2010) concluded which is that in regard to the operating decisions, executive managers of a firm adopting residual income method, mainly the EVA as a compensation and management tool, will make the decisions that would increase the assets disposition and decrease the new investment. As a result “Shareholders get what they pay for” (p.205).

Wallace (1998) provides survey evidence on firms that have adopted EVA-based compensation systems. While he shows that such systems can change and enhance managerial behaviour in general, he does not afford any indication of the individual manager’s performance.

Dissatisfaction with traditional measures has triggered a heated debate among researchers (Ittner and Larcker, 1998) as to whether EVA as an alternative to traditional measures or earnings will better capture the managerial contribution to the firm’s value and whether it has a significant association with the annual stock price. Academic researchers have put potential weighting on different tools to test this association; these tools are the correlation between these variables and annual stock return (Garvey and Milbouran, 2000) and the variances of performance measures to gauge their relative accuracy.

Generally, corporate governance describes the mechanisms that help align the interests and actions of managers with shareholders’ interests and the performance-based compensation system and is a critically important mechanism of such governance (Jensen and Murphy, 1990; Rappaport, 1986). Opinions about how to design the compensation contract differ widely among firms.

In this context, Garvey and Milbouran (2000) introduce a relatively standard principal-agent model as a different approach to address the historical debate between traditional and new performance measures. In this model the compensation scheme can be based on any set of two accounting–based performance measures and stock price rather than depending heavily on stock price alone as the optimal tool for compensation schemes. Doing this will shed light on the exact information content of each performance measure rather than on it is observable variability.

To conduct the empirical tests, Garvey and Milbouran begin by computing the value-added of firms that add EVA to their existing compensation plans that depend only on earnings and stock price to measure the performances. Following this the correlation between these performance measures and stock return was examined. Accordingly, they claimed that the most useful measure of value-added is the percentage reduction in compensation variance when EVA is added to the wage contract. Garvey and Milbouran have estimated this reduction and the relative R^2 for over 500 US companies for the period 1986-1987 finding that EVA adds little or no value (consistent with Biddle *et al.*, 1997). He contends that a firm's value is determined both by managers' efforts and choices and by other elements beyond managers' control (randomness).

However, the model proposed by Garvey and Milbouran treat both EVA and earnings as alternative performance measures regardless of how they treat the cost of capital. Furthermore, Garvey and Milbouran introduce two unverifiable explanatory variables that are "non-contractible but which are observed by capital market investors and revealed indirectly through the stock price" (Garvey and Milbouran, 2000, p.217).

Garvey and Milbouran conclude that the accounting measure of performance (earnings) continues to explain variances in compensation even when the stock return is included as an explanatory variable and firms do not use exactly the same weightings as the stock market in determining compensation. But what is important for companies is to know the circumstances under which EVA beats earnings. Garvey and Milbouran's paper restrict attention to the use of EVA as a measure for compensation even though the emphasis is at odds with the evidence that states that most firms use EVA for business planning and financial management purposes rather than in incentive plans. Although the contribution of Garvey and Milbouran enriched academic research with work on new performance metrics, his findings have been criticised.

In line with the argument put forward by Garvey and Milbouran, Rajan, (2000) argues that Garvey and Milbouran's analysis mainly accommodates the assumption that the shareholders observe other variables that are not contractible. This refers to the sensitivity of the accounting metrics to changes in stock price. It is unclear how the model would work if these parameters were not observed by the market since this information is essential for specifying the weighting of the relevant contracting variables for the purposes of compensation.

Correspondingly, Rajan criticises the way in which Garvey and Milbouran define his variables, where the fundamental distinguishing feature of EVA as a performance measure is the inclusion of capital cost against earnings to reflect the firm's cost of capital. Moreover, the earnings number itself is subject to various transformations in order to make it more representative of economic earnings. For example, R&D costs might be capitalised in the EVA metric so as to capture the long-term nature of those investments (Stern, 1991), while such costs are considered a burden when computing earnings in accordance with GAAP. Garvey and Milbouran's paper, however, makes no effort to capture any of these key institutional features. There is also no modelling of the process by which actions are transformed differentially into earnings numbers and EVA numbers.

Earnings and EVA are simplistically viewed as equivalent linear signals of some underlying component of value, with differential noise terms attached to them. In that sense, this model is potentially guilty of a "naming fallacy": what the model calls EVA could instead be expressed equivalently as "comprehensive income" or "earnings before interest, tax, depreciation, and amortisation (EBITDA)" or any other metric that is related to, yet distinct from, earnings.

Moreover, Rajan argues that Garvey and Milbouran (2000) do not actually resolve the question he sets out to answer with regard to EVA versus earnings: that is 'does it matter which is more highly correlated with stock returns?' In addition, as Garvey and Milbouran assumed, it seems reasonable that a consultant implementing EVA in a firm would have access to sufficient data about the metrics to obviate the need for R^2 information. His message, then, appears most relevant for the (uninformed) researcher. While this is an important constituency, it is perhaps a smaller audience than the one the author had set out to target.

In conclusion, from the highest level (executive managers) to the lowest level (unskilled hourly workers) in the pyramid, organisation members respond to how they are rewarded, and hence, the design of the compensation system influences strategic choices made by top executives as well as how those choices are eventually implemented throughout the entire firm. Coupled with the fact that pay is the most important single expense in most organisations, in the long run a firm's performance depends on whether or not compensation is used effectively.

2.2.2 Characteristics of the Performance Measures

Shareholders want to know whether executive managers are using the entity's resources efficiently in order to maximise their wealth. The separation between the interests of the entity's owners and the interests of shareholders, which are managed by professional managers, (or are expected to be), are considered one of the main reasons for creating performance measures.

Furthermore, shareholders try to prevent managers from using the entity's resources for the managers' own benefit and this will be established from the point of view of shareholders, through the creation of a performance measure which is used later for establishing a compensation system.

According to Rappaport (1986), the best compensation system is the one that aligns managers' and shareholders' interests. Unfortunately such alignment is difficult in the real world because conflict often exists between them.

Lambert and Larcker (1985) list at least three main types of conflict between shareholders' interests and managers' interests. First, managers and shareholders have different attitudes toward risk. Managers, acting only as economic agents, have a lower tolerance of risk than have shareholders. A second source of this conflict is the difference in decision-making time-horizons of managers and shareholders. Sometimes executive managers are evaluated by the board over a shorter time period than that used by shareholders for evaluating the same investment decisions. This will encourage managers to place emphasis on short term earnings rather than assess the value creation potential over the full life of the investments. The third potential conflict stems from the fact that shareholders focus on generating profit without paying any attention to costs incurred while managers try to get a pecuniary advantage for the company's benefit.

The performance measure is considered the most fundamental requirement for both successful planning and performance evaluation, but before going through its characteristics in depth, one fact in particular should be raised here: there are many factors that affect the value of the whole company which are beyond the manager's control (Rappaport, 1986). The manager is held responsible for only those activities that he /she can maintain control over.

For any performance measures to succeed, certain fundamental criteria must be met. First and foremost is the validity of this measure, which means that in order to support the validity of different accounting measures managers should apply and adopt accounting standards and methods that make economic sense and which will lead to unbiased reflection on the manager's performance. Second, the performance measure should be verified and computed from one set of true and clear numbers and therefore not easily manipulated. Third, accountability, which is classified as the only activities that managers have control over, should be used to assess their performance. Fourth, the globalism of the performance measure: the company as a whole should be evaluated in order to assess the executive performance and should be compared with the performance of competitors within the same industry sector and similar accounting standards used by accountants in different countries to calculate the value of the performance measures. Furthermore, firms must cope with accounting standards that are enforced by different international accounting bodies (e.g. IASB) in order to maintain easy access to, and understanding of, its realised accounting and financial data by different users of financial statements, while at the firm level doing this will make it an easy task for executive managers to analyse the extent to which globalization of the region in which a firm operates affects the firms' performance. Finally, the performance measure should be introduced in a manner that makes it easily understood by executives and top management and easily communicated to external parties, particularly the shareholders who can affect the election of the board of directors (Rappaport, 1986).

Stated equivalently, the performance metrics, in order to gain more value relevance, should consider the following factors. First, a measure should be insensitive to the choice of accounting approach- there should be free choice of accounting methods. Regardless of the accounting treatment followed by the accountants in various countries the performance measure must have the ability to accurately measure the performances under investigation. Second, the performance metric should evaluate the firm's current decision in the light of the expected future results. Third, it should carefully consider the inherent risk associated with the firm's decision. Fourth, the performance metric should neither penalize nor reward the decision maker for factors over which he or she has no control.

The focus at this point is on how accounting numbers will affect the stock price performances, and how these numbers can be used in establishing performance standards and also whether the firms adopting EVA as a compensation plan will enhance their operating, financing and investment decisions with regard to increasing the wealth of the shareholders.

2.2.3 The Information Content Theory

Ball and Brown (1968, p.161) stated that "an observed revision of stock prices associated with the release of the income report would thus provide evidence that the information reflected in income numbers is useful."

It is not easy to disclose all the information about a company and its activities in the annual report. However, the IFRS (IASB) and stock markets regulations in adopting countries force firms to release sufficient information in its annual reports (now on a quarterly basis) to help external users of the financial statements, specifically the shareholders and creditors to help decide whether or not to invest in, or lend to, a firm (the general purpose financial report standard).

The IFRS (IASB) are firmly of the view that financial reporting is not an end in itself but is intended to provide information that is useful for making business and economic decisions (Ahmed, 2004).

Thus, financial reporting is intended to provide information to help investors, creditors and other parties to assess the stewardship of the entity's management and the amounts, timing and uncertainty of prospective cash flows to the related enterprise. The financial information released is considered to have information content if it is useful for economic decision making and it has some impact on the firm's share price. Hence, unlike previous research, the current research will use the accounting figures needed to investigate the association of performance measures with stock price and stock returns as published in the financial lists rather than the use of proxies. The fact should be raised here that it is quite difficult to understand the information content of the accounting figures without considering the characteristics of the reliability and relevancy of this accounting information. Financial information is said to be relevant if it influences the economic decisions of users, which can be achieved by helping them to evaluate past, present, and future which it does if it has predictive or confirmatory value. Relevance and faithful representation are the key characteristics of useful financial information. The faithful representation should be neutral, free from error and complete.[5]

[5] IASB, the Conceptual Framework of Financial Reporting, 2011

The information content is fundamentally linked to the efficient market hypothesis. Under this hypothesis, especially the semi-strong form (where share prices are expected to reflect all available accounting information including the present value of future cash flows), accounting numbers have information content if security prices respond to released data (Wolk *et al*., 2001).

Formally, information content, valuation relevance, and value relevance are the three main approaches to have emerged in the last three decades for examining the effect of accounting information on financial markets. Lo and Thomas (2000) show that information content has remained constant while valuation relevance and value relevance have both declined with respect to return volatility, and non-linearity of the valuation models used (earnings composition model and the earnings expectation model).

Historically, three primary approaches were used to investigate the implication of accounting disclosures for security prices; the first are the information content studies (Beaver, 1968). The second, based on Ball and Brown (1968), are the valuation relevance studies. Third, based on association testing between prices and accounting measures, are the value relevance studies. According to Beaver, an event (announcement or disclosure) has information content if the price changes in excess of the amount due to the passage of time (i.e., expected return) when such announcement is released. Beaver compares the value of U^2 (the error term) in the announcement period to the value of this function in the non-announcement period. He concludes that the stock return variance is higher in the earnings announcement week.

Regarding the value added relevance studies, and consistent with the market efficiency hypothesis, Ball and Brown (1968) assumed that capital markets are both efficient and unbiased in that if information is useful in forming the capital asset price, then the latter will immediately be adjusted by the market in the light of the released information without leaving any possibility for abnormal gain. Since in the real world the efficient market hypothesis does not operate and many other (weaker) forms such as semi-strong or weak forms may, the findings of this research are undermined.

The focus of the valuation relevance approach (Ball and Brown, 1968) is on one or more specific accounting summary measures. In the Ball and Brown research, it was the earnings, and how these summary measures related to price changes. The summary measures are said to be valuation relevant if the sign of this measure is positively related to the changes in the stock price. Following this researchers used the magnitude of the slope coefficient of a linear regression of returns on net income as a metric of the extent to which earnings are less or more relevant in explaining returns (Collins and Kothari, 1989).

The value relevance approach discusses the association between market value and accounting summary measures such as earnings and book value. Formally, this approach requires that not only should the summary measure be identified by researchers, but so should the valuation method that links this measure to prices. Under this assumption a summary measure (performance measure) is said to be value relevant if it connects to market values significantly enough (Holthausen and Watts, 2000).

Thus, this thesis aims mainly to investigate the association between a set of performance measures and the stock price performances and to test whether any of the measures examined is able to explain variation in stock price.

2.2.4 The Incremental Information Content

As discussed in the information content section, financial information is said to have information content if it leads to a movement in share price, which means that the released financial information/figures will have the ability to affect the economic decision of the firm. On the other hand, if we have two accounting summaries (two performance measures) both with a relative information content and with one (X) containing more new information than the other (Y), we say that X has incremental information content beyond that in Y.

Bowen *et al.* (1986) assessed the incremental information content of additional firm disclosures made concurrently with annual earnings announcements. However, they did not investigate the incremental information content for accruals and cash flows. They therefore conducted further work in 1987, which extended the previous study by comparing the ability of the accrual measures (net income and working capital from operations (current assets – current liabilities)) and the cash flow measures (operating cash flow and cash flows after investment) to explain the variation in the cumulative abnormal return (CAR). More specifically they used the following model:

$$CAR = \alpha_0 + \alpha_1 Unexpected\ inco + \alpha_2\ Unexpected\ working\ capital\ from\ operations + \alpha_3\ unexpected\ operating\ cash\ flows + \alpha_4\ Unexpected\ cash\ flow\ after\ investment + \varepsilon$$

In addition, they used the random walk model to determine the unexpected part in each variable except for operating cash flows where, instead, they used past working capital from operation. They were relying on their previous conclusion that working capital from operating (WCFO) is a better predictor of future cash flows than current cash flows itself. In agreement, Dechow (1994) states that, as the working capital accruals have the power to diminish the negative serial correlation in cash flows then changing in past working capital from operation will have the ability to anticipate future operating cash flows than current operating cash flows.

Ball and Brown (1987) concluded that cash flows from operations (CFO) have incremental information content beyond that contained in earnings. Moreover, they contain incremental information relative to that in accrual measures (WCFO, Earnings). The results also reveal that the accrual measures jointly and separately have incremental information content beyond that contained in cash flow measures whereas working capital from operations has no incremental information beyond that contained in earnings. Along similar lines, Ali and Pope (1994) and Clubb (1994) reported evidence on the information content for cash flows. However the evidence on the incremental information content for operating cash flows was weak and not enough to support the usefulness of operating cash flows.

Board and Day's (1989) study is considered the first in the UK to examine the incremental information content of earnings components. Board and Day compared the respective abilities of net income, working capital from operations and net cash flows to explain the variations in stock return over the period 1961-1977. They declared that net income and working capital from operations separately hold more information content than net cash flows. They also extended their investigation to the incremental information content for these variables. The results pointed out that with regard to the incremental information content, net cash flow was the poorest of the measures examined.

Arnold *et al.* (1991) held a different point of view reporting evidence on the information content for cash flows, which was at odds with prior UK results. On a similar note, Ali and Pope (1994) and Club (1995) reported evidence on the information content for cash flows. However the evidence on the incremental information content for operating cash flows was weak and not enough to support their usefulness.

In a closely related study, Ali (1994) extended the work of Bowen *et al.* (1987) by using non-linear regression in addition to the linear regression used in prior studies. Based on US data for the period 1974-88, he examined the incremental information content of earnings, operating cash flows and working capital from operations. He even replicated the same model used by Bowen *et al.*, although the unexpected cash flows after investment (UCAI) were excluded. Moreover, he used the change in the variables as measures of the unexpected part (random walk model).

The results of the linear model were consistent with Bowen *et al.* except for the following: (1) regarding the incremental information content, working capital from operations out-performed earnings, and (2) cash flows from operations had no incremental information content relative to earnings or to working capital from operations. Ali (1994) suggested that the differences in the results were due to the differences in the sample and the period of the study. In the non-linear model, he divided the sample into two groups according to level of change in the absolute value for earnings. The first group (high-change in earnings) contain the observations whose absolute values lie above the median. The second group contained all the observations whose absolute values lie below the median. The same method was used to divide the sample according to the change in cash flows and to the change in working capital from operations.

The results of Ali (1994) indicated that the incremental information content of earnings (working capital from operation) was not a function of the change in earnings (working capital from operations). Cash flows from operations have incremental information content only in years with low change in operation cash flows. Ali also concluded that the non-linear model more effectively specified the association between stock return and the variables of the study.

In his seminal study, Wilson (1986) investigated the incremental information content for earnings, fund flows (either cash flows or working capital from operations) and accruals. His results show that fund flows have incremental information content beyond that which exists in earnings. In addition, current accruals (short term accruals) have incremental information content over that contained in cash flows whereas the long terms accruals (non-current accruals) show no value added over that which exists in working capital from operations. Livant and Zarown (1990) pointed out that decomposing earnings into operating cash flows and accruals does not improve the relationship with stock return. In the UK most studies used stock return as a proxy for future cash flows.

In this context, Biddle *et al*. (1995) distinguished between the two concepts. They contend that incremental information enquires whether one performance measure provides more information content beyond that provided by another. On the other hand, relative information enquires which performance measure has greater information content and applies when intending to choose among alternatives or when ranking by information content is required.

It is worth mentioning here that all prior UK and US studies reported different results regarding the incremental information content for cash flows and the components of accruals. This confusion in the results may be due to a number of reasons. Garrod *et al.* (2000) attribute these confusions to differences in the definition of cash flows used in different studies; to the diversity in the models used; to the variety in the time periods of the study; and to the effect of contextual factors. The contextual factors include differences between the economies of the countries where the studies have taken place. In other words, we can expect different results from the same model if we change the target market of the study. For instance, Board *et al*. (1989) used the same model for both UK and US data and produced different results regarding the value relevance of long-term accruals. Table 2.2 present a sample of US and UK studies that used traditional and cash flow measures to explain the variation in stock return performances.

In view of the above discussion, this thesis will use UK data and price models in order to examine the incremental information content of all the prime performance measures over a specific period of time and extends its aims to test whether decomposing earnings and EVA to their main components will contribute more to the association of these prime measures in explaining changes in annual stock price.

Table 2.2 Studies use earnings and cash flows to explain Share –price (return) relationship

Author (s)	Market	Period	Variables examined	Conclusion
Wilson, 1986 & 1987	US	1981-82	OCF, WCO,CA & NCA	Accruals and OCF have incremental information content beyond earnings. CA has incremental information content beyond OCF. WCO does not have incremental information content beyond E.
Bowen, Burgstahler and Delay.1987	US	1972-81	E, WCO, OCF & CAI	Cash flow data and accruals have incremental information content beyond each other. However, WCO has no incremental information content beyond E.
Dechow, 1994	US	1969-89	E & OCF	The value relevance of OCF decrease as the magnitude of both aggregate accruals and operating cash cycle increase. Short – term accruals have information content while long –term accruals do not have information content.
Ali, 1994	US	1974-88	E, WCO & OCF	The results of the linear model reveal that WCO has incremental information content beyond that already exist in E, OCF does not have information content beyond that already existing in either E and WCO. The results of non – linear analysis reveal similar results.
Ali and Pope, 1995	UK	1984-90	E, WCO & OCF	OCF has incremental information content beyond that already existing in E and WCO.
Clubb, 1995	UK	1955-84	E & OCF	OCF has incremental information content beyond that already existing in E.
Garrod and Hadi, 1999	UK	1971-91	E, components of CFS according to FRS1	Earnings have incremental information power beyond all cash flows variables, while cash flow variables did not reveal any incremental content beyond earnings.

Note: E is earnings. WCO is working capital of operation. OCF is cash flows from operations. CA is current asset. NCA is none-current asset. CAI is cash flows after investment. CFS is cash flows statement.

Source: Compiled by researcher.

2.3 Previous Studies

The relationship between accounting numbers (particularly earnings and cash flow) and firm performance (measured by stock price or stock return) is one of the areas that have been most exhaustively examined in previous research. In general these empirical studies (Beaver, 1968; Dechow, 1994) have adopted different approaches to investigating the questions raised about the relativity and superiority of different performance measures. The following section will present a detailed description of the debate surrounding them.

2.3.1 General Overview of Performance Measures

Accounting numbers represent a fertile area for the research that investigates the empirical relationship between firm value and particular accounting numbers for the purpose of assessing or providing a basis to assess a firm's performance. It is well known that the relevance of earnings (the after-tax profit available for stockholders) has been investigated intensively since the issue was first raised by Beaver (1968). Furthermore, many comparative accounting value relevance studies have focused on the comparison between accounting earnings and cash flow (e.g. Dechow, 1994; Aharony *et al.*, 2003). The following are some popular performance measures used in different articles to interpret the variation in annual stock price / return as a measure of a firm's value.

In this context, Ball and Brown (1968) investigated the association between earnings and annual stock return, and they extended their study to test the incremental information content of accruals, cash flows, working capital from operations, operations cash flow, and cash flow measures. Furthermore they used the operating cash flows as a proxy for annual earnings.

There have also been a number of studies concerned with the predictive ability of earnings. Bowen *et al.* (1986) investigated the relationship between earnings and cash flows, and used the following traditional definition of cash flows: net income before extraordinary items and discontinued operations plus depreciation; and net income plus depreciation, amortisation, and working capital from operations.

Along the same lines, Biddle *et al*. (1997) investigated whether the Economic Value Added (EVA) has incremental information content beyond that of earnings. They then extended their research to test whether EVA and the residual income (RI) method, and earnings before interest and tax (EBIT) outperformed other performance measures (earnings and operating cash flow) in explaining variation on annual stock return. EVA is defined as the profit earned by the firm less the cost of financing the firm's capital. It is similar to RI but adjusted for net operating profit after tax (NOPAT) and invested capital where needed. It is also referred to as net operating profits less a charge for the opportunity cost of invested capital (West and Worthington, 2000).

In a related study, Francis *et al*., (2003) investigate the incremental information content of earnings before interest, tax, depreciation, and amortisation (EBITDA), which refers to an amount in which all interest, tax, depreciation and amortisation entries in the income statement are reversed out from the bottom-line net income, and cash flows from operations (CFO) which refer to the cash a company generates from its operation activity presented in the cash flow statement.

The above mentioned performance measures will be discussed in depth in the following sections.

2.3.1.1 Reconciliation of Performance Measures

As we have already noted, researchers have held different points of view regarding the usefulness of earnings (accruals) and of cash flow items in explaining the variation in stock price and there is no consensus on any one performance measure. This, together with the criticisms of the previous performance measures (earnings, operating cash flow, and residual income method) forced researchers to look for other measures that amend the distortion of accruals measures and bring them closer to cash flow through making certain necessary adjustments for the main items of the income statement, specifically the net operating profit after tax (NOPAT).

In order to conduct this adjustment, analysts move upwards through the income statement, starting with EBITDA which refers to an amount in which all interest, tax, depreciation and amortization entries in the income statement are reversed out from the bottom-line net income. EBITDA purports to measure cash earnings, cancelling the effects of accrual accounting, tax-jurisdiction, and the effects of different capital structures.

$$\text{EBITDA} = \text{NOPAT} + \text{DEP} + \text{ATIn} \qquad (1)$$

Where NOPAT is net operating profit after tax, DEP is depreciation and ATInt is after tax interest. This construction of EBITDA differs from the operating cash flow in a cash flow statement primarily by excluding payments for taxes or interest as well as changes in working capital. EBITDA also differs from free cash flow (FCF) because it excludes cash spent to acquire, to replace or to update physical assets such as buildings and machinery (CAPEX).

In addition, free cash flows (FCF) refer to the cash available for distribution among all the securities holders of an organization (equity holders, debt holders, preferred stock holders, convertible security holders) which is equal to earnings before interest and tax (EBIT) adjusted to accruals and changes in accruals and working capital. Thus, FCF is equal to:

$$\text{FCF} = \text{EBIT (1-Tax Rate)} + \text{Depreciation \& Amortization}$$
$$- \text{Change in working capital} - \text{capital expenditure} \qquad (2)$$

The first branch of this equation simply refers to net operating profit after tax (NOPAT) which is the profit derived from a company's operations after tax but before financing costs and non-cash-book-keeping entries(Ross *et al.,* 2010). In other words it is equal to EBITDA less depreciation (DEP) and after tax interest (ATInt). Fundamentally, the first branch represents the total pool of profits available to provide a cash return for those who provide capital to the firm. The second branch of the equation is the invested capital (IC) which represents the firm's investment through the given period including variation of working capital. Hence we can redefine FCF as (Penman, 2001):

$$\text{FCF} = \text{NOPAT} - \text{ACCRUALS} - \text{IC} \qquad (3)$$

$$\textit{or FCF = NOPAT – Increase in capital} \qquad (4)$$

Similarly, Penman (2001) defined FCF as:

$$FCF = CF\ from\ operations - CF\ used\ in\ investment \qquad (5)$$

From the previous definition, we note that by deducting the invested capital from NOPAT we get FCF, but what happens if we deduct the cost of invested capital instead of invested capital? The result is the residual income (RI) which is used to measure the performance of management as a value added method so (Biddle *et al.*, 1997):

$$\text{RI} = \text{NOPAT} - (IC_{t-1} \times \text{WACC}) \qquad (6)$$

where WACC is the weighted average cost of capital. This basic formula in fact represents the value created in excess of the required return to the company's shareholders, which can be referred to simply as economic value added (EVA), that is the profit earned by the firm less the cost of financing the firm's capital (Stewart, 1991).

$$\text{EVA} = (\text{EBITDA} - \text{DEP} - \text{ATInt}) - \text{IC} \times \text{WACC}^{6} \qquad (7)$$

where EBITDA-Depreciation and amortization is equal to earnings before interest and tax (EBIT) and the EBIT × (1-tax) is equal to net operating income after tax (NOPAT).

This amount can be determined, among other ways, by making adjustments to GAAP accounting, including deducting the opportunity cost of equity capital (Stern and Stewart, 1991; Fernandez, 2002). Where EVA can be calculated after making certain important adjustments to NOPAT and the invested capital (IC), these adjustments are:

Operating Income
+ Interest Income
± Equity income (Loss)[7]
+ Other investment income
-Income Tax

= Net Operating Profit after Tax (**NOPAT**)

Short term debt
+Long-term debt (Including bond)
+Other long-term liability (Deferred taxes and provision)
+Shareholder's equity (Including minority interest)

= Invested capital (**IC**)

$$\textbf{EVA} = \textbf{NOPAT} - (IC_{av} \times \textbf{WACC}) \qquad (8)$$

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[6] Theoretically, the EVA equation is identical to the RI equation. Basically it is obtained after some adjustment to NOPAT and the invested capital, debt and equity.

[7] Equity income refers to income generated by existing assets (real estate, stocks). It usually refers to dividend income which is a type of revenue available to shareholders that derives from the company's profit and is paid on a per-share basis.

Stern and Stewart (1991), the founders of EVA, argue that this method of performance suffers from accruals distortions which mainly stem from the depreciation method applied by different companies. Hence extra adjustments to EVA will bring it as close as possible to the cash flow method (Young, 1998), where the cash value added (CVA) metric (which is equal to the EVA adjusted for depreciation (DEP) and economic depreciation (ED)), represents the best answer for this claim, and is defined as:

$$CVA = EVA + DEP - ED \qquad (9)$$

The economic depreciation represents the loss in the productive capacity of a physical asset. It is the annuity depreciation expense (different from accounting depreciation component as reported in the accounting reports) which, when capitalised at the cost of capital (WACC), the assets' value will accrue at the end of their useful life. This term will create uniformity between firms and eliminate the effects of the depreciation method that vary between entities. Using the NOPAT formula CVA can be verified to be (Petravicius, 2008)[8]:

$$CVA_t = RCF = NOPAT_t + DEP_t - ED_t - (D_{t-1} + EBv_{t-1})WACC \qquad (10)$$

where RCF is the residual cash flows, NOPAT is the net operating profit after tax, DEP is depreciation and amortization, ED is the economic depreciation and equal to $= \frac{RC \times WACC}{(1+\mathrm{WACC})^{\mathrm{t}} - 1}$ where RC is Gross fixed assets, or equal to (ROE – K_e) Ebv_{t-1} where D_{t-1} is debt book value, EBv_{t-1} is equity's book value and WACC is the weighted average cost of capital. However, because of the difficulty we face while tracing the useful life of different firms assets that are needed to calculate the economic depreciation (ED), this research will use the simplified version of CVA, where CVA is equal to cash flows from operations minus the cash flows demand, the dividends and interest:

$$CVA = CFO - OCFD \qquad (11)$$

However, the inherent concern within the accounting community over the relationship between market value and accounting numbers has led to the proposal of different measures for assessing and evaluating the performance of companies as a whole, such as value based measures (VBM) and other residual income methods (Ball and Brown,

[8] As defined by Boston Consulting Group (BCG) or Frederik Weissenrieder Consulting.

1968; Patell and Kaplan, 1977; Stern and Stewart, 1991). The most commonly used measures are the economic value added (EVA) framework founded by Stern and Stewart Co., and the cash value added (CVA) introduced by the Boston Consulting Group and Holt Value Associates (Malmi and Ikaheimo, 2003).

2.3.2 Accrual versus Cash flow measures

The majority of evaluation methods use income statement figures to build and compute different forms of performance measures that help shareholders to evaluate those companies in which they have invested and to measure the performance of managers required to use this investment to maximise shareholders' wealth.

Since 1968 an extensive amount of research has been conducted into the information content of earnings' components. Ball and Brown (1968) analysed a sample of firms over the period 1944 – 1966 to test the information content of accounting numbers (annual earnings) and investigate its association with abnormal returns. The approach they adopted for this research relied on the assumption that the income of different firms within a specific market has tended to move broadly together. The early findings of Ball and Brown (1967) stated that 35 to 40 per cent of the variability in the level of an average firm's earnings per share (EPS) could be associated with economy-wide effects, especially when income was defined as tax-adjusted return on capital employed.

They constructed two alternative models of what the market expected income to be and then investigated the market's reactions when its expectations proved false. A simple linear regression was used to test the proposed association in which changes in firm *i* income regressed against the change in the average income of firms in the market. This showed that the information contained in the annual income number was useful in that it is related to stock prices.

Ball and Brown's research was the first to discuss the information content of accounting numbers and has been replicated many times by different scholars (Beaver and Dukes, 1972; Bowen *et al.* 1986; Board and Day, 1989). They measured the association between annual earnings (operating cash flows) and the abnormal return using the operating earnings as proxy for operating cash flows and they reported that earnings showed a higher correlation with abnormal stock return than cash flows.

However, the assumption of Ball and Brown is similar to that of CAPM (the capital market is both efficient and unbiased). Hence, the assets price will rapidly adjust with the release of information without leaving any chance of abnormal gain. This is actually considered a criticism of their research, because in the real world the perfectly efficient market may not exist although weaker forms of efficiency (semi-strong and weak form) may hold in reality.

By using a different proxy for operating cash flows the seminal study of Beaver and Dukes (1972) concluded that unexpected earnings, which they defined as earnings plus depreciation, depletion and amortisation charge, and the change in deferred tax account, were more highly associated with abnormal returns than unexpected operating cash flows. In a related study, Patell and Kaplan (1977) examined the information content of cash flows beyond that already existing in earnings. They calculated cash flows as earnings after extraordinary items plus depreciation and deferred tax minus unremitted earnings attributable to foreign consolidated industries plus other adjustments. They pointed out that operating cash flows provided no information beyond that which existed in earnings. As will be noted in earlier studies the operating cash flows showed no information content beyond that which existed in earnings which may be due to the naive method used in calculating the operating cash flows.

Correspondingly, Bowen *et al.* (1986) examined the relationship between accounting earnings and cash flows for a sample of US data over the period 1971-1981. They used the following traditional definitions of cash flows: net income before extra-ordinary items and discontinued operations plus depreciation (NIBEI), net income plus depreciation and amortisation (NIDPR), and working capital from operations (WCFO). In addition, they employed three recently devised measures for cash flow: cash flow from operations (CFO), cash flow after investment (CFAI), and change in cash and short-term marketable securities (ΔC).

Their aims were to answer the following questions:

1. Are the traditional cash flow measures used in prior studies highly correlated with alternative measures of cash flows that have really been advocated by academics and practitioners?
2. Are accrual accounting earnings and cash flow measures highly correlated?
3. Do earnings or cash flow variables best predict cash flows?

An empirical study by Bowen *et al*., (1986) concludes the following:

1. Measures of cash flows (NIBEI, WCFO) are poor proxies for cash flow.

2. Traditional measures of cash flows are more highly correlated with accrual earnings than alternative measures (CFO, CFAI, and ∆C).

3. The correlation between traditional measures and more recent measures is lower than the correlation between traditional measures and accrual earnings.

4. The traditional measures of cash flow, WCFO and NIDPR, were better predictors of future cash flow from operations than cash flows from operations themselves and from net income before extraordinary items.

Their results were in contrast with the FASB 95[9] assertion that earnings are better predictors for future cash flows than current cash flows.

The evaluation of the company's performance is considered one of the greatest challenges researchers have ever met. For many decades accounting earnings were the most popular approach for evaluating management performance until the initiation of the evaluation model that was based on cash flow items (Board and Day, 1989).

Board and Day (1989) examined the comparative ability of net income, working capital from operations and net cash flow to explain the variation in stock return over the period 1961-1977. They pointed out that net income and working capital from operations have, separately, more information content than net cash flows. They also investigated the incremental information content for these variables. Their results indicate that net cash flows have the poorest incremental information content.

Based on UK data over the period 1985–1993, Charitou *et al*. (2001) investigated the value relevance of operating cash flow and earnings under three contextual variables: (i) earnings permanence, (ii) earnings growth, and (iii) firm size. The results revealed that earnings had incremental information content over cash flow while operating cash flows revealed incremental information content beyond earnings when pooled data were used. The results also conveyed that prior operating cash flow was significantly positively associated with stock return and indicated that firm size and market to book ratio (risk

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[9] Summary of statement No.95, Statement of cash flows (1987) updated to IAS7 Statement of cash flows.

proxies) improved the explanatory power of the model they adopted to conduct their research.

Similarly, Francis *et al.* (2003) examined the relative and incremental information content of earnings before interest, tax, depreciation, and amortization (EBITDA), cash flow from operations (CFO) and earnings (EARN). Their sample covers 16 industrial companies in the period 1990-2000. The Standard and Poor Index (S&P) published reports were used to identify the most applicable performance metrics within different industries and also to determine those industries to which the non-GAAP performance metrics (i.e. not calculable from numbers reported in the audited financial statements).

The methodology applied by Francis *et al.* was to classify the industries according to the claimed preferred performance metric applicable within the chosen industry, then assess its ability in samples of industry where the non-GAAP performance metric is the preferred metric in explaining the variability on stock return. Hence, the tested hypothesis was whether the preferred GAAP metric outperformed the non-preferred GAAP metrics in explaining returns.

The main contribution of the research by Francis *et al.* is the introduction of the non-GAAP performance metric (non-earning, non-cash metric) and the assessment of the usefulness of industry-specific performance measures in predicting either or both earnings and revenues.

In summary, Francis *et al.* indicate that earnings significantly outperform both EBITDA and CFO across industries using these preferred performance metrics. The findings also show that EBITDA significantly outperforms CFO for the pooled and industry sample, whereas Francis *et al*. show that EBITDA does not outperform EARN for any industry even though it is considered the preferred metric within the chosen industry. This finding holds within the industry level.

Turning to incremental power, the findings of Francis *et al.* reveal that all the GAAP metrics show incremental power in the presence of other non-GAAP metrics within the pooled data analysis, whereas the annual regression results show that EARN has highly significant incremental explanatory power in comparison to both EBITDA and CFO for each pooled and year regression. The research by Francis *et al*. provides consistent evidence that each preferred metric has significant incremental explanatory power in its preferred sample (Board and Day, 1989; Ali, 1994; Wilson, 1986, 1987; Chen and Dodd, 1997: Forker and Powell, 2008).

Similarly, the findings of Francis *et al.* show that EARN has high explanatory power in describing variation in stock return and outperforms the non-GAAP metric. The same is found using EBITDA and CFO. The results also indicate that all the GAAP metrics have incremental explanatory power compared to those that exist within non-GAAP metrics (except for the homebuilding industry where the finding is that non GAAP metrics add little incremental power to explain return). One interesting finding by Rayburn (1986) is that the information contained in accrual components is what explains and justifies the incremental information content of earnings beyond that already existing in cash flow measures.

Because there are no conclusive results for the usefulness of earnings and cash flow items, neither the accrual earnings, nor the cash flow items, was a perfect method for measuring management performance as an approach to evaluating the whole firm (shareholder wealth) (Bowen *et al*., 1987; Charitou *et al*., 2001). Nevertheless, the bulk of empirical evidence indicates that the superiority of cash flow measures vis-à-vis earnings (as variously defined) has not been demonstrated.

2.3.3 Value-Based Measures and Residual Income Method

The adage has long persisted that in order for a company to generate value and to create wealth it must earn more than it costs by way of debt and equity. The added value concept has been promoted strongly in performance measurement literature. This notion is historically referred to as the residual income (RI) method (a value–based measure). A periodic performance measure was introduced by Stern and Stewart (1991) to replace earnings and cash flow from operations as a measure of performance. They called it Economic Value Added (EVA). Stewart (1994, p.75) argues that ‘EVA stands well out from the crowd as the single best measures of value creation on a continuous basis’. He also remarked that ‘EVA is almost 50% better than its closest accounting-based competitor (i.e. earnings) in explaining changes in shareholder wealth’ (p.75).

From a different point of view, Ball and Brown, (1968) and Patell and Kaplan, (1977) highlight their contention that there is no single optimal accounting measure that accurately explains the variability in shareholders' wealth. A mass of empirical research has been conducted to test the validity of the residual income model as an alternative to the discounted cash flow model in equity evaluation, which specifies the relationship between equity values and accounting variables such as earnings and book value (Ohlson, 1995). Ohlson models a firms' value as a linear function of earnings, book value, and other unspecified information (Fundamental Value, V_t) that plays an important role in linear information dynamics and proposes consensus analyst forecasts as a proxy for V_t.

However, some empirical research claims that even the traditional dividend discounting model is the basis of the Ohlson model. The residual income model breaks new ground on two fronts (Dechow, 1999). First, it has the ability to predict and explain stock prices more effectively than the models based on discounting short-term forecasts of dividends and cash flows. Second, it provides a more complete valuation approach than popular alternatives because of the inclusion of non-GAAP metrics (Francis *et al.,* 1997; Frankel and Lee, 1998).

However, analyst forecasts depend in part on the information contained in current earnings and book value. Analyst forecasts, therefore, not only reflect information about future earnings beyond that conveyed by earnings and book value (the definition of V_t), but also reflect, among other things, the 'stale' information concurrently conveyed by the accounting fundamentals (Dechow *et al.,* 1999).

Unfortunately, this empirical research ignores something essential to Ohlson's model, which is information dynamics. However, the results of both valuation models and dividend discounted models appear identical regardless of whether earnings are capitalised or forecast, 'but make no appeal to book value or residual income' (Dechow *et al*., 1999, p. 2).

Correspondingly, Dechow *et al*. used the annual financial statement for the period 1976-1995 to evaluate the empirical implications of Ohlson's model. Unlike previous research the information dynamics that link current information to future residual income were incorporated. They stated that the Ohlson model was a restricted version of the standard dividends discounted model that comprised three basic assumptions. First, when the expected dividends are discounted to their present value the amount yielded is equivalent to the price of shares. Second, the clean surplus accounting relationship is maintained. The third assumption addresses the character of the relationship existing between the present value of future dividends and the current information.

In their analysis Dechow *et al.* focus on the improvements provided by Ohlson's model over these simpler and more restrictive models, by imposing additional restrictions to the dividends discount model. This restriction represents the ignorance of the other information factors when analysing earnings forecasts. Dechow *et al.* contend that the 'Ohlson model assumes that expectations of future abnormal earnings are based solely on information in current abnormal earnings and that abnormal earnings are purely transitory. Consequently, expected future abnormal earnings are zero and price is equal to book value. This restricted version assumed that accounting earnings are used to measure value creation' (p. 9).

After the empirical assessment of the residual income valuation model and the imposition of the information dynamics that describe the formation of abnormal earnings expectations, Dechow *et al*. conclude that models that simply capitalise earnings forecasts in perpetuity outperform information dynamics models in explaining stock prices. Furthermore, subsequent research showed that the superiority of the simple capitalisation model over the information dynamics model stems from the fact that investors are generally presumed to 'overweight information in analysts' earnings forecasts and under-weight information in current earnings and book value ' (Dechow *et al*., 1999, p.32).

2.3.3.1 The Validity of the Performance Measure's Components

Garrod *et al.* (2000) used the basic Edward-Bell-Ohlson (EBO) model to measure the value relevance of earnings' components. By adopting a cross-sectional analysis for UK data over the period 1992-1996 they concluded that the disaggregation of earnings into its prime components (i.e. cash flows and short and long term accruals) significantly increased the explanatory power of the model. However, this increase in significance mainly resulted from decomposing earnings into operating earnings and operating assets rather than from decomposing earnings into its components i.e. cash flows and accruals.

They also investigated whether the value relevance for cash flows and earnings' components was affected by the magnitude and the sign of the three following contextual variables: (i) operating cash flows (ii) earnings and (iii) short term accruals. The methodology they used are as follows. First, they divided the total sample into two sub-samples according to the sign of the contextual variables. Then the positive sample was divided into four groups according to the magnitude of the variable, the first group containing the lowest values from the contextual variable and the fourth group containing the highest.

The results of Garrod *et al*. (2000) supported the above conclusions that cash flows have information content and that the cash flow model has the highest explanatory power for the variation in price per share. They reported also that there was no value difference between accruals and operating cash flows. However, long-term accruals were valued differently in extreme cases where the contextual variables were negative or too positive. Short term accruals were rarely valued differently. From the above results Garrod *et al*. drew the conclusion that 'the isolation of accruals from cash flows only takes on valuation significance in conditions which are unusual and unlikely to persist' (p.15).

Biddle *et al.* (1997) investigated whether EVA dominated and had incremental information content beyond that of accrual earnings and also extended their investigation to test whether any of EVA's components had a higher association with stock return and firm value.

Biddle *et al.* used a sample of 219 firms over the period 1984-1993 to test whether the EVA and RI outperformed the mandated performance measures, earnings and operating cash flow in explaining contemporaneous annual stock returns. These firms fell into two main categories, those which adopted EVA as a performance measure and those which did not. Moreover, they also tested whether the components unique to EVA and/or RI contributed more to explain contemporaneous stock return beyond that explained by CFO and earnings. They began their investigation by describing how the variables of this study are linked to each other through a reconciliation process starting with earnings before extraordinary items (EBIT) and ending with EVA.

The findings of Biddle *et al.* (1997) were that all the variables (EVA, RI, CFO, and EBIT) were significant at a conventional level, and that both EBIT and RI have the higher adjusted R^2 and outperformed EVA. Unlike Stern and Stewart (1991), this study could not support the claim that EVA had greater information content than earnings. For the incremental information, the results (based on F-statistic tests) indicated that both CFO and Accrual had the highest incremental information content in explaining market-adjusted returns, while the components of EVA (ATI, CC, Accrual ADJ) appeared to make little contribution to the incremental information content. When combined with the relative information content findings above, these results suggested that, 'while EVA components offer some incremental information content beyond earnings components, their contributions to the information content of EVA are not sufficient for EVA to provide greater relative information content than earnings' (p.20).

In particular, the focus of Biddle *et al.* (1997) was on developing a statistical test for the comparison of explanatory power, and the availability of data was the main criterion used to select the sample for study in the proposed test. From the research perspective, this raises concerns over subjectivity and prevents the results of Biddle *et al.* from being globally compared to other research findings.

Furthermore, Forker and Powell (2008) criticised the findings of Biddle *et al.* They state that Biddle *et al.*'s research design is 'however, subject to the limitation that shareholders' return (an equity metric) is regressed on contemporaneous measures of performance that are measured at the entity (operating) level of the firm. Restricting the analysis to a single period contemporaneous association with firm values and returns does not address the problem that one-period measures of residual income are not necessarily associated with the shareholder changes in wealth reflected in security returns. Also, an association between one-period returns and a charge for the cost of capital is potentially mitigated by the charge having little variation across a sample of large firms' (p.6).

In a similar vein, West and Worthington's (2000) study based on 110 Australian companies over the period 1992 through to 1998, examined the association of EVA, earnings, net cash flows, and residual income with annual stock return. In addition they extended their research to test whether EVA had incremental information content and outperformed conventional accounting-based measures. In their response to Stewart's (1991) claim that EVA is the best performance measure regarding its ability to capture the true economic profit of a firm and to the recommendation of Biddle *et al.* , West and Worthington examined which of the components of EVA and earnings were more likely to contribute to, or subtract from, the information content.

West and Worthington used the same methodology as Biddle *et al.* , starting by describing the linkages between the different competing measures of firms' performances, except that, unlike the latter's empirical research, they used the pooled-time series, cross–sectional least squares regression to conduct their studies.

West and Worthington's research indicates that (as with the Biddle *et al.* study) all the performance measures have a significant association with adjusted annual stock return variation, where earnings before extraordinary items (EBEI) were the most reliable predictor, whereas EVA is the least reliable predictor of the four accounting measures. For the incremental information content the results show that the most logical pairing of information variables in explaining market return is EBEI and EVA.

The second phase of West and Worthington's study is to examine the components of EVA; the results convey that all the components are significant but that accrual (ACC) has a greater explanatory power than the other variables in explaining variation in stock return.

Conversely Worthington and West (2004) form different conclusions regarding the superiority of EVA, based on Australian data. They contend that EVA is highly associated with stock return and outperforms all other performance measures, namely residual income, earnings and net cash flows.

2.3.3.2 Performance Measurement of Productive Activity

For any company to succeed in an increasingly competitive market, it has to know the cost of its entire economic chain (productive activity) in order to maximise the shareholders' wealth. To do so a company should have the ability to manage the economic cost of its entire production chain rather than its cost alone, so what it needs to do is create value not control cost. To accomplish this aim a company needs sufficient data on the total-factor productivity where EVA is designated as its best measure (Drucker, 1995). Moreover, the transformation from traditional costing into the activity-based costing system (ABC), within the complex high technology industry sector encourages the adoption of EVA together with benchmarking to measure and compare the performance of different companies to determine that of the best performance within the sector (Drucker).

Essentially, what makes EVA superior to the other, traditional performance measures (e.g. earnings, performance ratio), is its ability to incorporate the cost of invested capital (IC) when measuring the value added or created by the company (Stern and Stewart, 1991; Fernandez, 2000) and also its ability to measure in effect the productivity of all producing factors in a complex manufacturing unit (Drucker, 1995). In addition it has the ability to indicate why a certain product or service does not add value; it shows what the executive manager needs to find out and it identifies whether any remedial action is needed in order for certain products and services to generate value.

The ccost of capital is thus the most important aspect of EVA. Under traditional methods most companies appear to be profitable whereas in reality they are not (Stern and Stewart, 1991). In a related note Drucker (1995) observes that “Until a business returns a profit that is greater than its cost of capital, it operates at a loss. Never mind that it pays taxes as if it had a genuine profit. The enterprise still returns less to the economy than it devours in resources. It does not cover its full costs unless the reported profit exceeds the cost of capital. Until then, it does not create wealth; it destroys it” (p.59).

2.3.3.3 Value –Based Measures versus Traditional Accounting Measures

As a new concept of performance measurement EVA has aroused much concern, especially in the advanced economies. In spite of its being widespread as a performance measure, its implementation and validity has generated intense debate (Anastassis, 2007; Forker and Powell, 2008).

Historically, predictability and variability were used as the main criteria to gauge the quality of earnings and, hence their usefulness to investor decisions. In this context, Forker and Powell (2008) used these two criteria to test empirically the quality of EVA relative to generally accepted accounting principles (GAAP) earnings, residual income, cash flows, and other mandated metrics in the USA and the UK. Unlike Biddle *et al.* (1997), Forker and Powel (p.1) were using a proxy ‘for accounting quality by applying the long window- methodology to obtain hindsight valuation errors based on the difference between ex ante actual market value and discounted ex post metrics as a proxy for accounting quality’.

Forker and Powell’s focus in particular was on the value relevance embedded in the recognition of the cost of capital, a factor noticeably absent from the issues under consideration by the International Accounting Standard Board (IASB) in its quest to improve financial reporting quality. Forker and Powell claim that, theoretically, EVA outperforms earnings because it meets the requirements of the residual income method as it strictly adopts the practice of clean surplus accounting that takes into account all factors impacting on shareholder wealth when measuring income and because it recognises the cost of equity capital (valuation of equity).

Forker and Powell (2008) conducted their test for valuation errors using three steps: first by reporting the main cross-sectional valuation errors and the differences between main paired valuation errors for each long-window; then by reporting the variability of the individual valuation errors for all econometric measures; and lastly by providing the actual cross-sectional errors and differences in errors across all windows and terminal dates. Two sets of data were used to conduct this test: the USA data-set containing 1,000 firms for the 16 year period 1986 – 2001; and the UK data-set containing 500 firms for the 12 year period 1990 –2001.

The rule they applied here was that 'the smaller the mean and variability statistics for valuation errors the higher its accounting quality and decision usefulness in forecasting future value' (Forker and Powell, 2008. p.18). In addition, the t-test and Wilcoxon signed test were used to examine the significance of different measures. Their results showed that the best performance measure for all windows was the residual income before exceptional and extraordinary items [RI (1), RI (2)].[10] It is clear that the exclusion of the cost of capital from conventional earnings is a direct source of error in estimating intrinsic value.

However, in their study of the association between market returns and alternative performance metrics, Forker and Powell find that residual-based metrics outperform the GAAP-base metrics from which the non-cash cost of equity capital is excluded. In terms of performance metrics' forecasting powers the residual-based metrics have the ability to outperform operating cash-flow-based metrics. Moreover, Forker and Powell's results show that the differences between EVA and residual-based measures are small, a finding inconsistent with that of Francis *et al.* (2000). Further, unlike Biddle *et al.* (1997), the key results reported that the residual income method (RI) and earnings before interest and tax (EBIT) have the higher adjusted R^2 and outperform EVA.

However, the main paradigm of firms is to create and maximise shareholder wealth. This is the wealth that is evaluated in terms of different performance measures and it may be measured in terms of returns received on investment which could be in the form

[10] Forker and Powell define RI (1): residual income before exceptional and extra-ordinary items with Stern and Stewart end of period capital employed. RI (2): residual income after exceptional and extra ordinary-items with Stern and Stewart end of period capital employed.

of dividends, capital appreciation or both. But the crucial question here is what single performance measure should be used by different interested parties to evaluate a firm.

Closely related to the last point, Anastassis and Kyriazis (2007) investigate the explanatory power and the incremental information content of EVA against those of traditional performance measures such as net income and operating income. They contend that, unlike the traditional measures, EVA takes into consideration the cost of the capital invested to generate profit, (recognising that a company is going to create value only when, besides its various operating costs, it covers the cost of its invested capital). Considering this, the only difference between EVA and Residual Income method (RI) is the adjustment that Stewart (1991) suggests for the calculation of invested capital and net operating profit (NOPAT). Supporters of the EVA performance measure suggest more than one hundred adjustments for the NOPAT and the IC. The most common and important adjustments are those for good will, operating lease, research and development expenses, provisions and deferred taxes (Young, 1999).

Greek data for the period 1996–2003, (a time that witnessed the transformation of the Greek stock market from an emerging and relatively weak form, to the developed and more efficient one after year 2000) were used by Anastassis and Kyriazis to investigate whether EVA would outperform other traditional performance measures. Furthermore, they replicated the model introduced by Biddle *et al*. (1997) to test for the relative information content of EVA.

Anastassis and Kyriazis used both panel regression and Cox pool regression (a test for non-nested regression) to test for the relative information content and incremental information content. The results reveal that with respect to abnormal stock returns operating income (OI) has the highest explanatory power (R^2), followed by net income (NI) and then residual income (RI) whereas the explanatory power of EVA appears to be the least. Regarding the incremental information content result their findings convey that both EVA and OI are equivalent, and outperformed by both NI and RI. In addition, the Wald test reveals that, for the EVA components, 'both the capital charge (which is also included in RI) and the Stern and Stewart (1991) adjustment do not have any value relevant information additional to that which is already incorporated in the traditional accounting variables' (Anastassis and Kyriazis, 2007. p.15).

Contrary to previous regression results (abnormal return as dependent variable), EVA outperforms all the other profitability measures when the regressions run against the market value (MV). This is actually compatible with the theory behind EVA (time value assumption), which states that the discounted value of all the EVAs the company assumes it will achieve in the future, is equal to the current MV. Therefore, as assumed, the value of EVA is better correlated with market value (MV) than accounting variables (Anastassis and Kyriazis, 2007)

However, according to the Cox test, in spite of EVA having the highest R^2 (this difference does not appear to be statistically significant), the finding of Anastasia and Kyriazis 'fails to provide adequate support for Stewart's (1991) claim that EVA tracks changes in MV better than any other performance measure, since it appears that the other earnings measures are equally competent of explaining the variation in MV' (p.23).

The results of Anastassis and Kyriazis's model (2007) for the first difference (one year lag) show statistically insignificant differences in the information content of RI, OI and EVA. For the incremental content of EVA components the results indicate that NI is the only one providing statistical significance whereas the changes in both operating income adjustments and Stern and Stewart (1991) adjustments are of no importance to the market. The Wald test also supports the evidence that 'the first difference of operating income adjustment, capital charge (CAPCH) and Stern Stewart adjustments (ACCADJ) does not add any useful information to that already incorporated in the change in net income (NI)' (Anastassis and Kyriazis,2007, p. 18).

Along the same lines, Riahi (1993) investigated the relative and incremental information content of certain variables (value added, earnings, and cash flows) using the US data. In surveying the relative information content he concluded that value added is a significant explanatory factor in stock return and, moreover, it has more power of explanation in relation to general return of stocks. In surveying incremental information content Riahi (1993) introduces the combination of value added and net profit as the best explanation of stock return.

The association of earnings with stock return (price) and firm values has been the focus of many accounting research studies (Ball and Brown, 1968; Beaver and Ducks, 1972) for the past five decades, and many of these empirical studies have investigated the information and incremental information content of earnings (accruals) beyond that which already exists among different performance and evaluation methods. Further, much of this research supported the finding that earnings outperform all other performance measures that derive from discounted cash flow and residual income (Pattel and Kaplan, 1977). Some have suggested that, in order to improve their explanatory power, earnings should be deconstructed into their main components to show whether these provide more information content than earnings itself (Bao and Bao, 1998).

The study carried out by Bao and Bao (1998) investigated the association between performance and value added and concluded that the latter was positively associated with firm value in certain industries. EVA as a surrogate for abnormal economic earnings has recently received much attention as another performance measure and many researchers (Anastassis and Kyriazis, 2007; Forker and Powell, 2008) considered it the best performance measure. It has even been predicted by different researchers (Lehan and Makhija, 1997; Chen and Dodd, 1997; Erasmus, 2008) that EVA will supersede earnings and earnings per share as the proper financial measures but this claim has faced much controversy and the view that even if EVA has some merit it is not as promising as its creators have claimed (Biddle *et al.*, 1997).

Bao and Bao (1998) employ three types of analysis to examine the usefulness of abnormal economic earnings and value added. These comprise a firm's value analysis (market value of equity) in which a firm's value regress "against earnings and other GAAP–related variables, levels studies regress prices/returns on earnings while changes study regress prices/returns on changes in earnings" (p.5). Samples of 166 firms for the two year period 1992 - 1993 were used to conduct the research.

The results of the firm value analyses reveal that for the year 1992, only EVA is significant in explaining firm value, while the earnings add little value when paired with value added. Furthermore, the sign of abnormal economic earnings coefficient always comes against the forecasts (negative all the time). The results were the same for the year 1993. For the incremental information analyses the results show that, consistent with Riahi-Belkaoui (1993), value added has higher relative and incremental content than earnings.

The results of Bao and Bao specify that for the level analysis shown, even though EVA has the correct sign, it is not a statistically significant variable and has a lower power of explanation than the other variables amongst which value added appears the most highly significant. Furthermore, the change analysis results convey that while EVA remains significant with higher explanatory power and the correct anticipated sign of correlation (positive), the earnings and abnormal economic earnings are insignificant, with a different sign of correlation than forecast.

When using the initial price of stock as a deflator the results reveal that contrary to the level analysis finding all the explanatory variables of Bao and Bao's study are statistically significant. Consistently, EVA has greater explanatory power in comparison to those of earnings and abnormal economic earnings.

Bao and Bao (1998) therefore conclude that "economic value added is not as promising as Stern and Stewart have claimed, the usefulness of EVA as abnormal economic earnings surrogate, therefore, is an empirical issue" (p.5).

More recently, Mehdi and Iman (2011) investigated the relativity and incremental information content of EVA over traditional measures. They used the data from the Iranian stock market for the period 2001 to 2008 to investigate the association between EVA, traditional measures and the stock return. The results do not support Stern and Stewart's claims and reveal that stock return is highly associated with return on assets (ROA), return on equity (ROE), and earnings per share (EPS), while EVA appears to have little information content beyond that which exists in other traditional accounting measures.

However, an empirical question arises here. Which measure has the better association with stock return? Most interestingly, previous studies that have mainly used US data consistently show superior relative value relevance (or information content) for value added over income (Riahi-Belkaoui, 1993; Bao and Bao, 1998). 'Because these studies were limited to the few US companies which report the employee compensation data needed to compute value added, it is possible that these results are influenced by self-selection bias' (Darcy, 2006, p.3).

2.3.3.4 Modification of EVA as A Performance Measure

Shareholder pressure on firms to maximise their wealth and to incentivise executive managers to align their interests accurately with those of shareholders increased and reached unprecedented levels (Rappaport, 1986; Young, 1997; Lovata and Costigan, 2002). Thus, managers' compensation contracts should be designed to include the most appropriate measure for evaluating their performance, and not necessarily the historically dominant stock price measure. Furthermore, the stock price may not be an efficient and proper contracting parameter because it is generally driven by many factors beyond the control of the firm's managers (Bacidore *et al.* 1997).

Moreover, any selected performance measures to be used in managerial compensation schemes must be highly correlated with changes in shareholder wealth and should not be subject to all the essential randomness of an entity’s stock price (Bacidore *et al.*). As Bacidore *et al.* 1997 have stated, ‘This dichotomy is the fundamental tension a good performance measure must resolve’ (p.11). He also claimed that EVA as proposed by Stewart (1991) would best resolve this tension as it has the creativity to secure better linkage of the firm’s accounting data with its stock market performance.

Bacidore *et al.* present an empirical analysis to examine both the ability of EVA to measure the abnormal return changes and the correlation between EVA and abnormal return. Moreover, they claim that the most suitable performance measure should have the ability to measure how the strategy of management can influence shareholder value. This influence is measured by the risk-adjusted return on invested capital. Finally, the performance measure should clarify how well the firm has generated operating profits, given the amount of capital invested to produce those profits (Bacidore *et al*., 1997).

According to Bacidore *et al*. (1997), EVA is calculated as the net operating profit (NOPAT) adjusted for the increase in bad debt and LIFO reserve; plus any increase in net capitalised R&D; plus amortisation of goodwill; plus other operating income; minus operating cash taxes; and minus the adjusted book value of net capital at the beginning of the period (NA).

Bacidore *et al.* used a sample of 600 firms selected from the Stern and Stewart performance 1000 database for the period 1982 through to 1992 to examine the association between EVA and the abnormal stock return. After running the regression of abnormal returns against the EVA as explanatory measures, the results showed that both EVA is significantly associated with abnormal return. But, after the inclusion of lags as explanatory variables to the regression, in order to test whether past realisation of EVA has a significant effect on abnormal returns, the results convey that EVA is significantly positively related to abnormal return whereas the lag EVA is significantly negatively related to abnormal return.

Contrary to the claim of Bacidore *et al.* (1997) that REVA as a performance measure is superior to EVA, Ferguson and Lestikow (1998) stated that EVA in reality is superior to, and more widely spread, than REVA since its introduction by Stewart and Stern. The key distinction between these two measures was that capital charge was based on the firm's market value instead of its net assets value. Thus, the main assumption of Bacidore *et al.* is that an appropriate measure of operating performance must correlate highly with abnormal stock return. This assumption seems plausible to Ferguson and Lestikow (1998) who claim that management decisions that alter shareholder wealth also cause a corresponding abnormal stock return. The theory suggests, however, that no appropriate single-period measure of operating performance should be highly correlated with abnormal stock return.

Accordingly, the main criticism of the work by Bacidore *et al.*, is that the use of abnormal stock return as a basis for rewarding management is likely to be inconsistent with shareholder wealth maximisation. To this end, Ferguson and Lestikow (1998) used the traditional dividend discount model to prove that EVA is more consistent than REVA with finance theory and wealth maximisation.

2.3.3.5 Individuals Focus of Value -Based Measures

Most of the empirical research on economic value added focuses on the firm as a unit of analysis whereas none of these studies focuses on individual managers or examines how each individual will perform under different performance measures.

In terms of the assessment of the top management performance, Lehn and Makhija (1997) (through the use of a sample of 452 entities during the period 1985-1994) empirically examine the ability of EVA as a new performance measure, together with return on sales (ROS), ROA, ROE, and market value added (MVA) to explain not only the variation in stock return, but also the probability that a CEO will be dismissed for poor performance. They claim that EVA appears to be a considerably more reliable indicator of CEO turnover than profitability ratio measures (i.e. ROS, ROE). Lehn and Makhija conclude that in spite of it having the higher correlation among the other performance measures, EVA and MVA are not the most efficient criteria.

In their study of how managers perform under an EVA bonus scheme, Cahan *et al.* (2002), examined whether the managers who are compensated using EVA-based bonus plans outperform the managers who are compensated on traditional accounting-based bonus plans. This system, they claim, can change managerial behaviour at the firm level. However, they do not provide any evidence on the performance of the individual manager. Cahan *et al.* (2002) contend that 'one reason to expect better performance for managers on EVA bonus plans is that an EVA-based reward system better aligns the interests of the manager and the firm' (p.8).

Based on the findings of Wallace (1998), there is evidence to suggest that EVA is hard to understand and implement. Cahan *et al.* (2002) used a sample of 117 managers in major international New Zealand Companies which included 52 on EVA bonus schemes and 65 on traditional schemes.

Basically Cahan *et al.* were interested in the coefficient interactive term between the budget type and the understanding of EVA, and expected it to be positive and significant which means that the relationship between bonus type and performance depends on the understanding of EVA. Moreover, they contend that managers with a high understanding of EVA produce a higher performance when their firms adopt an EVA–based bonus plan.

The result of Cahan after running the regression on the full model shows that 'the high EVA understanding has a quite dramatic positive effect on the performance of managers on EVA reward systems while high EVA understanding actually has a slight negative effect on managers on traditional reward systems' (Cahan *et al.*, 2002, p.19). Cahan *et al.* attributed the negative effect of the latter to cognitive imbalance. Furthermore, when accounting–based performance systems are used to evaluate those managers who best understand EVA, their performance may experience cognitive conflict, and consequently, may decline (Cahan *et al.*,).

For the reduced model adopted by Cahan *et al.* (interactive term excluded) the results show that managers with EVA bonus plans and high EVA understanding outperformed other managers in those areas in which manager have high EVA understanding and traditional reward system. To sum up, the findings of Cahan *et al.* illustrate that there is an interactive effect on overall performance between bonus plan types and the understanding of EVA and demonstrate that, given differences in the delegation of decision rights and strategic focus, EVA bonus plans might not be optimal in all areas of operation. Finally, controversy to Stern and Stewart's claim that EVA is easy to understand by different managers' level (high understanding) Cahan *et al*. (2002) state that EVA understanding is not always high.

2.3.3.6 Cash Value Added (CVA) as a Performance Measure

Scholars have different points of view regarding the usefulness of traditional accounting (earnings and accruals) and cash flow measures in explaining the variation of stock price performance. However, the criticisms that the traditional and value added measures have faced and the arguments raised by Young (1999) regarding the Stern and Stewart adjustment (i.e. that the main aim of this adjustments is to produce a modified version of the EVA that undermines the drawbacks of accrual based measures by developing new performance measures that have the properties of cash flows (cash value added metric)), all encourage researchers to develop new performance measures that can better measure the performance of firms and managers.

In response to the above controversy, Ottosson and Wiessenrider (1996) proposed a new performance measure entitled cash value added (CVA)[11] - the surplus of cash flows - to replace the traditional accounting and value added measures, specifically the periodic measure EVA.

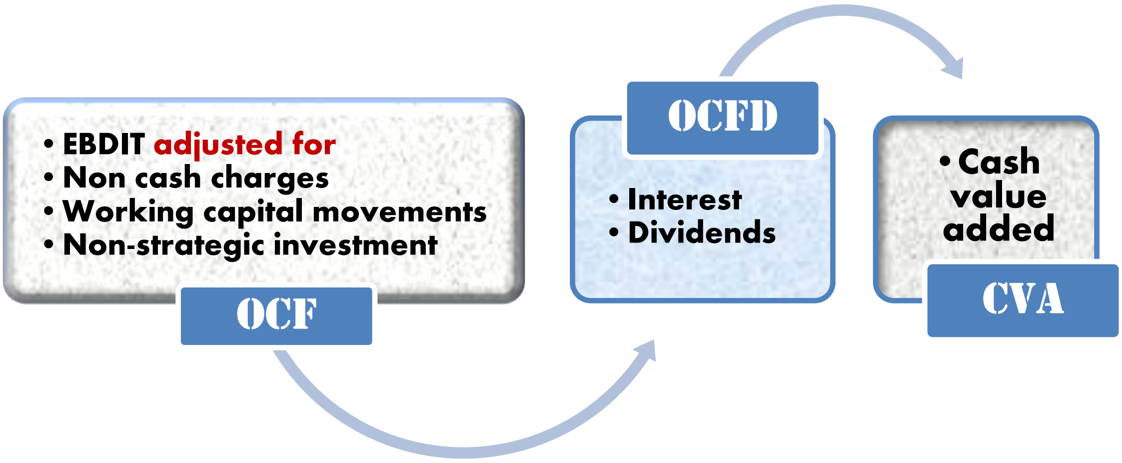
In this context, Ottosson and Wiessenrider argue that the focus of moderate management, unlike traditional management accounting, should be on the strategic investment (that creates value) and they should not waste valuable time on controlling and evaluating non-strategic investment decisions. In addition, they claim that 'the fundamental difference between accounting and CVA method is that the CVA method holds that managers are responsible for the evaluation of the CVA information' (Ottosson and Wiessenrider, p.7).

According to Ottosson and Weissenrieder, the CVA is simply defined as the difference between operating cash flow (OCF) and operating cash flow demand (OCFD). The first part basically represents the earnings before depreciation, interest and tax (EBDIT) adjusted for non-cash charges, working capital movements and non-strategic investments; the secondary investment supports the main investment decision taken to increase the wealth of shareholders. The second part refers to investors' capital cost, mainly the interest and dividends (see figure 2.1). Furthermore, the OCFD 'represents

[11] This is a trademarked performance measure that was developed by the global management consultant 'Boston Consulting Group (BCG)' a U.S company founded in 1963 and which came to prominence in 1973.

the cash flow needed to meet the investors' financial requirements on the company's strategic investments' (Ottosson and Wiessenrider, 1996, p.5).

Figure (2.1) Calculation of CVA



Based on Ottosson and Weissenrieder (1996)

The concept of CVA is similar to economic value added but takes into consideration only cash generation as opposed to economic wealth generation. This measure provides investors with an idea of the ability of a company to generate cash from one period to another. Generally speaking, the higher the CVA the better it is for the company and for investors. In addition Malimi and Ikaheimo (2003) stated that these metrics, the EVA and the CVA, should be used to evaluate the performance from senior management and divisional operating heads all the way down, in some cases, to personnel on the lower level. Mashaykhi (2009) defines CVA as the activities performed by the company and its employees to create value and increase the wealth of the entity and Petravicius (2008) refers to CVA as the cash remaining after deducting the cost of invested capital (IC × WACC) from the adjusted operating cash flows. This residual cash will be used to generate investment to an entity. CVA as a performance measure has received increased attention, especially in the European and Asian financial markets, ever since it was first proposed by the Boston Consulting Group.

Fernandez (2002) investigated whether EVA, economic profit (EP), and cash value added (CVA) have the ability to measure value creation by different firms. He employed General Electric Company (GE) data for the period 1991 through to 2000 to run his regression model while Petravicius (2008) investigated how new performance measures such as Market Value Added (MVA), Economic Value Added (EVA), Cash Value Added (CVA), and Cash Flow Return on Investment (CFROI) will support the effectiveness of traditional accounting numbers. Collectively, their results indicate that new performance measures, the value added measure, are superior to the traditional measures in evaluating the performance of executive managers and the company as whole. This is attributed to the inclusion of the cost of invested capital when calculating the value added measures.

Furthermore, Fernandez (2002) claims that cash value added (CVA) has an advantage over EVA because the results of his research indicate that CVA, over the period of study, makes more sense than EVA especially in those periods when the General Electric Company (GE) appears to destroy value rather than create it. This claim arose because the GE company began generating negative cash value added (CVA) in time of destroying value while the economic value (EVA) generated remained positive all time. He also claimed that CVA is more appropriate than book earnings for evaluating executive performance.

Along the same lines, Mashaykhi (2009) used Iranian data from 408 companies listed on the Tehran stock exchange for the period 1998 to 2003 to investigate the relevance and the incremental information content of cash value added (CVA) and value added (VA) beyond that which already exists in earnings (E) and cash flow from operating (CFO). The OLS technique is used to test the relationship between the variables of this study and the annual stock price.

Mashaykhi's regression results indicate a significant relationship between value added and a stock return. However, the cross-sectional regression shows an unstable coefficient over time. For the purposes of the cash value added measure the results show an insignificant relationship between cash value added (CVA) and annual stock return on both pooled and cross-sectional data and the explanatory power is quite low. The findings also show that earnings have the highest explanatory power among these variables.

The results reveal that accrual measures have more information content beyond that already contained in operating cash flow followed by value added and cash value added respectively. The adjusted R^2 for the value added is greater than R^2 when cash value added combines value added as an explanatory variable. Contrary to the above findings the results indicate that the cash value added has incremental information content over value added in 1998 and 1999. In addition, the results indicate that earnings have incremental content beyond operating cash flow, but not vice versa.

Moreover, when all the variables are combined into one multi-regression model, the result shows that for different periods through the cross-sectional level both value added data and traditional data have incremental information content beyond each other, whereas for the pooled data, value added data and traditional data have incremental information content beyond each other (Mashaykhi, 2009).

Urbanczyk *et al*. (2005) used data from five large Polish companies for the period 1997 through to 2002 to investigate whether value added performance measures (EVA, CVA) have the ability to outperform traditional accounting measures. They defined CVA as the value a company creates over its cost of capital. They also considered CVA as a developed version of Cash Flow Return on Investment (CFROI)[12] which represents the real cost of equity and gross investment that is defined as a gross cash flow a firm creates over the invested capital. Urbanczyk *et al*. state that CVA is considered an improved alternative to EVA because the latter ignores the impact of depreciation on cash availability, while CVA includes the effects of depreciation on NOPAT and invested capital, thus CVA is:

$$\text{CVA} = (\text{ROGA} - \text{WACC}) \times \text{Gross Asset} \qquad (10)$$

Where ROGA is the return on gross asset which is equal to gross operating profit after tax divided by gross asset, WACC is the weighted average cost of capital, and Gross Asset, asset plus depreciation, is the value of an asset before depreciation.

The results of Urbanczyk *et al*., show that all the selected Polish companies generate a negative EVA and CVA which implies that they all generated net losses and destroyed their shareholder wealth, whereas when applying the book value and traditional performance measures these companies appear more profitable. Urbanczyk *et al*. attributed the negative value of CVA and EVA to the privatisation process that was taking place among Polish companies. Furthermore, they state that these companies needed a long time to generate value after privatisation and the difficulty of calculating

[12] CFROI was developed by the Swedish Company Boston Consulting Group as a performance measure which is equivalent to NOPAT after adjusting for depreciation.

the cost of capital, and depending mainly on book value to estimate the weighted average cost of capital, undermines their findings.

2.3.3.6.1 CVA versus EVA

Regardless of its matching and timing problems, CVA is considered the best alternative to EVA for evaluating management performance and as a step in the process to evaluate the whole firm and it seems to get its strength from the weakness of EVA (Escalona, 2003).

Fama and French (1996) argue that the cost of capital, one of the main figures in calculating the EVA, is computed by using the capital asset pricing model (CAPM). However, methodologically, EVA has structural difficulties in both the efficient and the non–efficient capital markets, and its method has been criticised by both behavioural and traditional approaches. The main criticism is that the CAPM is valid under the assumption of strong and semi–strong efficient markets; but these two forms of efficiency have not been evidenced by empirical research. Therefore, the EVA method is considered to be an inefficient approach for evaluating and computing the cost of capital.

If markets were efficient in the real world, all asset returns would be located on the capital market line (CML). Among the main assumptions of CML is that the prices of assets would be calculated in accordance with their intrinsic values. Another important assumption is that the net present value will equal zero as the required rate of return is equal to the internal rate of return (IRR). In this case EVA should be equal to zero because in its simpler case it measures the differences between required rate of return and internal rate of return. Therefore, EVA attempts numerical measurement in efficient markets which do not exist in accordance with the definition, and consequently the EVA is a financial fiction in the logic of efficient markets, and does not satisfy the criteria as being a preferable evaluation model under these assumptions.

EVA, developed by Stern Stewart, is the difference between the firm's after-tax return on capital and its cost of capital. Stewart[13] (1991) defined EVA as residual return that subtracts the cost of invested capital from net operating profit after tax. EVA is equal to

[13] Stewart III, G. B., 1991. The Quest for Value. Harper Business, New York.

the economic book value of the capital at the beginning of the year and the difference between its return on capital and cost of capital.

EVA (Economic Value Added) is a model based on a company's accounting. Its mechanism is therefore similar to accounting (Weissenrieder, 1997):

Sales

- Operating Expenses

- Tax

= Operating Profit

-Financial requirements

= EVA

The conclusion here is that the estimation of cost of capital is a great challenge as far as EVA calculation for a company is concerned. Thus EVA is an undesirable method for computing the cost of capital and we should not use it as a method of valuation. Therefore the basic cost of capital computation, i.e. CAPM, has been rejected due to the existence of a weak relationship between return and the systematic risk coefficient (β) (Fama and French, 1996). But at the same time it does not mean that CVA is the perfect method for evaluating the firm. Again EVA has a weak theoretical grounding and, just like other accounting numbers, it is all too easy to manipulate.

Companies adopt EVA because it is easily understood by different levels of employees. It can be implemented in the way most accounting systems can, the accounting reality, whereas the implementation of CVA is an interactive process between the employee active in the financial realities (top management, shareholder's representatives) and the ones active in the business reality (technicians, controllers). Thus, "the implementation of CVA might therefore be perceived as being more difficult than implementing EVA because it requires more attention from the organization. This attention is however the attention necessary (and wanted) in order to reach the level of change in the organization towards Shareholder Value" (Weissenrieder, 1997, p. 10).

2.4 Summary

The literature review discussed in this chapter shows that a large number of empirical studies have investigated the association that exists between accounting performance measures and stock return (Ball and Brown, 1968; Patell and Kaplan, 1977; Dechow 1994). Such work, from the viewpoint of market efficiency, 'is useful since if a high correlation exists between accounting-based information and market returns, then the variable under consideration would provide an accurate indication of the firm's value, and therefore increasing firm value or identifying market under-pricings could be made solely on that basis' (West and Worthington, 2001, p.12).

Previously, the focus of empirical study has been on traditional accounting measures, earnings and accruals, but in subsequent research value added measures have received much attention (Beaver and Duck, 1972; Bowen *et al*., 1986). Furthermore, extra effort has been directed toward examining the significance of the components of prime performance measures, such as capital charges, accruals adjustment, and accounting adjustments (Biddle *et al.*, 1997).

It is worth noting here that the UK and US studies discussed in this chapter reported different results regarding the information and incremental information content of the different main performance measures (and their components). These mixed results may have several explanations. Garrod *et al.* (2000) suggested a number of factors: (i) differences in the definition of cash flow used in different studies, with different figures being used as proxies for cash flows on some occasions; (ii) differences in the econometric models used; and (iii) differences in the time periods examined in the studies and the effect of contextual factors (e.g. national economic conditions). In other words, we may get different results from the same model if we change the target market of the study. For instance, Board *et al.* (1989) used the same model for both UK and US data and found conflicting results regarding the value relevance of long-term accruals.

Responding to the controversies that exist in the field of performance literature and to the criticism that Biddle *et al.* (1997) raised against EVA as the best alternative to the traditional and other value added measures this research will uses UK data to introduce evidence on the role of traditional accounting, cash flows, and value added measures in explaining variations in stock prices. The methodology of this research is stimulated by prior US and UK studies[14] that provide a theoretical framework and empirical analysis of the role of different performance measures, earnings and EVA components in explaining annual price changes.

[14] This study mainly benefits from the studies of Barth *et al.*, and Biddle *et al.*, who provide evidence of the incremental information content for the main accruals and EVA components.

Chapter 3

Research Design and Methodology

3.1 Introduction

This chapter describes the main features of the research design approach adopted in this study. It also provides a summary of the main methodological steps the researcher intends to adopt. It presents and discusses the major methodological tools and concepts employed as a means to achieve the objectives of the present research. In particular, two major aims are worth noting. The first aim is to review the various performance measures adopted in the literature. The second aim is to develop and present the main hypotheses of this study.

This research will be based on a cross- sectional design to assess the association between a set of performance measures and the annual stock price performance. Performance measures will be classified into three categories: traditional accounting measures, cash flow measures, and value added measures. These categories include: net income (NI); earnings before interest, tax, depreciation and amortization (EBITDA); earnings before extraordinary items (EBEI); cash flows from operations (CFO); economic value added (EVA); and cash value added (CVA).

The plan of this chapter is as follows. Section 3.2 will discuss the main research questions. The development of the main hypotheses of this study and the building of the study's models are discussed in sections 3.2.1, 3.2.2 and 3.2.3. Sections 3.3 and 3.3.1 provide a definition of the variables of the study and the deflator factors. Section 3.4 sheds light on the characteristics used to select the sample, and finally section 3.5 summarizes this chapter.

3.2 Development of Hypotheses

As far as our objectives are concerned, there are two main approaches to research depending upon the objectives that the researcher is seeking to achieve. The following are the two approaches used: positivism (quantitative or deductive approach) and the phenomenological (qualitative or inductive approach) (Hussey, 1997).

Positivism is defined as 'an epistemological position that advocates the application of the nature science to the study of social reality and beyond' (Bryman, 2007, p.16). On the other hand the phenomenological approach focuses on the study of the nature and meaning of phenomena (as they appear to us either experimentally or consciously) (Finlay, 2008).

Table (3.1) illustrates the differences between the inductive (phenomenological approach) and the deductive approaches (positivism). It shows their distinctive characteristics and the circumstances of their employment.

Table 3.1: Distinctive features of the deductive and inductive approaches

Deductive approach	Inductive approach
• Moving from theory to data • The need to explain causal relationship between variables • Based on quantitative data • Researcher independent of what is being researched • Concerned with hypothesis testing • Generalises from sample to population • Uses large samples • Reliability is high but validity is low	• A close understanding of the research context • A more flexible structure to permit changes of research emphasis as the research progresses • Based on qualitative data • Concerned with generating theories • A realisation that the researcher is part of the research • Uses small samples • Reliability is low but validity is high

Source: Saunders, 2007; Kumar, 2005.

The inductive approach has many appealing features. For example, it offers a more flexible structure and does not require large amounts of data. However, it is not suitable for the present study for many reasons. First, the present study does not intend to generate a theory, a task that the inductive approach is well designed to do. Second, in accounting and finance, the data is almost exclusively quantitative and the sample sizes are generally large, including huge quantities of company data.

Thus, given that this study is based on accounting data, and given that we are primarily concerned with testing specific hypotheses and answering specific research questions, the deductive approach seems more appropriate.

Therefore, to ensure conformity with the objectives of the present research the quantitative approach will be employed. According to Kumar (2005) each method, tool and technique has its unique strengths and weaknesses. In other words, there is an expected trade-off between the various methodological choices regarding research question setting, hypotheses development, data collection, and data analysis.

By using the deductive approach, which is based on addressing the research question followed by the research hypotheses, Hussey (1997) and Kumar (2005) emphasised the important role of hypotheses for ensuring clarity. Hence, I begin by addressing the research questions that are consistent with the objectives of the research and stating the questions as hypotheses. According to the deductive approach the hypotheses will identify the independent variable(s) and the dependent variable (Hussey).

As will be shown, the dependent variable is the three month closing share price following the reporting date; we allow three months for the accounting information to be reflected in the stock's price[15], while the independent variables are identified as follows: net income (NI), earnings before interest, tax, depreciation and amortization (EBITDA), earnings before non- recurring items (EBEI), cash flows from operations activities (CFO), economic value added (EVA), and cash value added (CVA).

As was noted in Chapter 2 estimating the appropriate performance measure is the concern of the market-based accounting researchers. Some researchers (Moehrle *et al.*, 2001; Charitou *et al.*, 2001) claim that traditional accounting measures have the ability to outperform any other performance measures in explaining variation in stock prices. On the other hand, opponents of value based measures (VBM) (Stern and Stewart, 1991; Dechow *et al.*, 1999; Francis *et al.*, 2003) claim that measures that take into account the cost of capital when evaluating the performance of companies/managers, such as residual income method (RI), economic value added (EVA), and cash value added (CVA) are better to explain stock return variances and outperform traditional accounting (e.g. earnings, EBITDA, NOPAT) in explaining variation in the stock price.

[15] This approach was used by Fama and French (1992). The purpose of this strategy is to avoid look-ahead bias.

Moreover, other empirical studies claim that value added measures, that take into account the cost of capital invested, are better than other performance measures and have incremental information content beyond that which exists within traditional performance measure cash flows in predicting future cash flows (West and Worth, 2000; Anastassis and Kyriazis, 2007).

Consistent with the objectives of the research and referring to the literature review on performance measures as explanatory variables of the variation in annual stock prices, and after selecting six performance measures, this research will attempt to address the following questions:

1. *Among the three performance measures (traditional measure; cash flow measure; and value added measure), which one provides the best explanation of variation in stock price performance?*
2. *Does the decomposition of earnings into cash flows and accruals components have incremental information content beyond aggregate earnings?*
3. *Does the decomposition of EVA into its main components have incremental information content beyond aggregate EVA?*
4. *Does a given performance measure provide more information content beyond that provided by other performance measures?*
5. *Does the adoption of EVA as a compensation and management tool enhance the overall performance of firms and encourage manager to adopt decisions that are supposed to lead to shareholders' wealth maximization.*

To provide answers to these questions, four hypotheses are developed in this section. These hypotheses will be organized under the following headings: traditional measures versus cash flows and value added measures, earnings versus earnings' components (cash flows and disaggregate accruals) and EVA versus EVA's components. Chapters 5 and 6 will provide a detailed answer to question 5.

Before beginning the models' construction processes, we will start by demonstrating how both the price and return models are arrived at. The linear information model (LIM) introduced by Ohlson (1995) is the model used to derive the popular type of the value-relevance model. I start by introducing the residual income valuation method which has three main assumptions. First, a firm's value is defined by the dividend discount model as the present value of future expected dividends. That is,

$$P_t = \sum_{\tau=1}^{\infty} E_t \left[\frac{d_{t+\tau}}{(1+r)^{\tau}} \right]$$

where P_t is the price of the firm's equity at time *t*, $E_t[d_{t+\tau}]$ represents the expected value of the dividends that a firm is expected to pay at time $t+\tau$ conditional on time *t* information, and r is the discount rate, assumed to be constant. Second, the assumption of clean surplus relation (CSR) is:

$$b_t = b_{t-1} + x_t - d_t$$

where the firm's book value at time *t* is b_{t-1} , x_t is period t earnings, and d_t is the dividend paid at time *t*. The third assumption is that the firm's equity grows at a rate less than *r* (Lo and Lys, 1999), that is:

$$(1+r)^{-\tau} E_t[d_{1+t}] \rightarrow 0, \ \ as\, \tau \rightarrow \infty$$

Combining the dividend discount model with clean surplus relation yields:

$$P_t = b_t + \sum_{\tau=1}^{\infty} E_t \left[\frac{x_{t+\tau} - rb_{t+\tau-1}}{(1+r)^{\tau}} \right] - E_t \left[\frac{b_{t+\infty}}{(1+r)^{\infty}} \right]$$

Under the regularity assumption $\{(1+r)^{-\tau} E_t\,[d_{1+t}] \rightarrow 0, as\, \tau \rightarrow \infty\}$ the last term of the equation is equal to zero, the abnormal earning (or residual income) is defined as $x_t^a \equiv x_t - rb_{t+\tau-1}$ after substitution for abnormal return the Residual income valuation model (RIV) will be:

$$P_t = b_t + \sum_{\tau=1}^{\infty} E_t \left[\frac{x_{t+\tau}^a}{(1+r)^{\tau}} \right]$$

To estimate the price evaluation method the RIV model will combine the linear information model (LIM) introduced by Ohlson (1995) that suggests the time-series behaviour of abnormal earnings is as follows:

$$x_{t+1}^{a} = \omega x_{t}^{a} + v_t + \varepsilon_{1,t+1} \qquad (ID1)$$

$$v_{t+1} = \gamma v_t + \varepsilon_{2,t+1} \qquad (ID2)$$

where v_t is any information other than abnormal earnings, ω is the persistence parameter of abnormal earnings and assumed to lie in the range $0 \leq \omega < 1$, γ is the persistence parameter of other information predicted to lie in the range $0 \leq \gamma < 1$, and ε_1, ε_2 are the error terms. The combination of the RIV and LIM model will generate the following valuation model:

$$P_t = b_t + \alpha_1 x_t^a + \alpha_2 v_t \qquad \text{(OM1)}$$

where $\alpha_1 = \frac{\boldsymbol{\omega}}{\mathbf{1+r-\omega}}$ and $\alpha_2 = \frac{\mathbf{1+r}}{(\mathbf{1+r-\omega})(\mathbf{1+r-\gamma})}$

Replacing x_t^a with $x_t - rb_{t-1}$ gives an alternative formula:

$$P_t = (1-k)b_t + k(\varphi x_t - d_t) + \alpha_2 v_t \qquad \text{(OM2)}$$

where $k = r\,\alpha_1$ and $\varphi = (1+r)/r$.

In the literature, equations OM1 and OM2 are known as price level equations and theoretically they are considered as the source for many researchers that investigate the relation between stock prices, book value of equity, and earnings. These price level equations are often translated into a simpler econometric model (Easton 1999, p. 402; Easton and Sommers 2000, p.34: Barth and Clinch, 2009, p. 20).

$$P_t = \beta_0 + \beta_1 b_t + \beta_2 x_1 + \varepsilon_t$$

However, it is clear that this model is misspecified as the dividend present in the right hand side of the equation OM2 is omitted. Consequently even if we assumed that the unobserved v_t is replaced by the error term, the above empirical model is likely to yield spurious results.

Ohlson (1995) used the above price level equation OM2 to derive an equation portraying the return as a function of shocks to earnings and other information. He provides the theoretical basis for the return model by taking the first difference in equation OM2 and dividing both sides of the equation by the beginning-of-period price that gives:

$$Ret_t = (1-k)\frac{x_t}{P_{t-1}} + k\varphi\frac{\Delta x_t}{P_{t-1}} + k\varphi\frac{d_{t-1}}{P_{t-1}} + \alpha_2\frac{\Delta v_t}{P_{t-1}}$$

where $Ret_t = \frac{p_t - p_{t-1} + d_t}{p_{t-1}}$, $\Delta x_t = x_t - x_{t-1}$, and $\Delta v_t = v_t - v_{t-1}$. This equation is viewed as the theoretical basis for the following return model (Lo and Lys, 1999; Ota, 2003):

$$Ret_t = \beta_0 + \beta 1\frac{x_t}{P_{t-1}} + \beta_2\frac{\Delta x_t}{P_{t-1}} + \varepsilon_t$$

The above model is simply an approximation, with an omitted relevant variable (dividends). This model was used, for example, by Biddle *et al.* (1997) and Bao and Bao (1998).

3.2.1 Traditional Measures versus Cash Flows and Value Added Measures

As indicated in the debate raised by the literature review regarding optimal performance measures, there is no consensus as to which of the evaluation models better fits the firm's value (Barton *et al.*, 2010). A number of empirical studies stated that the cash flow measures (operating cash flows, cash value added) are better summary measures of expected future firm's performance[16] than earnings. This is because stock prices and other firm's performances can be linked to the expected future cash flows but earnings could be noisy (e.g. Ali and Pope, 1995; Clubb, 1995). However, the earnings

[16] A firm's ability to generate future cash flow affects the value of its securities.

proponents suggest that stock prices and other firm's performance measures are better explained by current earnings than current operating cash flows (e.g. Moehrle *et al.*, 2001; Charitou *et al.*, 2001). Other studies conclude that a combination of current cash flow data and accruals data outperform earnings alone and cash flows alone in predicting future cash flows (e.g. Barth *et al.*, 2001). In contrast, Ottosson and Wiessenrider (1996) introduce CVA as a new performance measure to replace accruals and other cash flow measures.

The accounting earnings approach has faced severe criticism from many scholars because it could easily be manipulated by both accountants and managers (Stern and Stewart, 1991). Moreover, earnings reflect events that happened in the past and it is difficult to judge whether its components will be permanent or recur in the future. This shortcoming appears to cry out for proposals for new performance measures. Hence, researchers and practitioners have proposed new methods to evaluate the management performance such as residual income method (RIM)[17], economic value added (EVA)[18] and operating income (OP) to interpret the stock price. Similarly, the residual and value added methods have met with much debate from traditional method supporters. The traditionalists claim that the cash flows and value added methods suffer from matching and timing problems. One of the main aims of this thesis is to investigate the association between the most important performance measures (discussed in chapter two) and the annual stock price performance.

We will also discuss cash value added (CVA) as a value added performance measure and will carry out a test to assess whether CVA has any association with annual stock prices and whether it has any incremental information content beyond the other criteria used to measure firms' and managers' performance.

As is well known, performance measurement is not always an easy task. The efficient market hypothesis states that markets are unpredictable and that current prices fully reflect all available information. A straightforward consequence of this is that (historical) accounting measures have no added informational value. Another argument is that prices are forward looking, in the sense that prices reflect what investors expect to earn from their investments in the future. Thus, insofar as accounting information cannot predict the future accounting or economic performance of a firm, all accounting

[17] RIM involves discounting estimated future residual income over the entire life of the firm.
18 EVA is the difference between the firm's after-tax return on capital and its cost of capital.

measures are likely to miss unobservable factors that are essential for predicting future firm performance. Finally, as we have seen earlier, scholars are divided as to whether a single accounting measure beats other measures in explaining stock prices. In summary, the current wisdom is that it is unlikely to find a single accounting measure that outperforms all alternative measures.

Based on the above, the following null hypotheses are proposed:

H_{01}: There is no significant statistical relationship between each of the following three classes of accounting measures (traditional accounting performance measures, cash flow measures and value added measures) and annual stock prices.

H_{02}: Value added measures and cash flow measures provide no incremental information content other than that already contained in traditional accounting measures.

In order to test for the information content hypothesis, a simple OLS regression model is used to examine the validity and the relevance of different performance measures. These measures are divided into three groups, namely traditional accounting measures, cash flow measures, measures and value added measures.

The price model and the return model are considered the most pervasive valuation models (Barth *et al*., 2001). Theoretically, both price and return models are economically equivalent since they are derived from the same source, which is the Ohlson linear information model (Ota, 2001).

Researchers in accounting must often choose between return models in which returns are regressed on a scaled earnings variable, namely earnings and earnings changes, and price models, in which stock prices are regressed on earnings per share and book value. The inherent problem in the price models is often referred to as 'scale effects,[19] and those in the return models are termed 'accounting recognition lag,[20] and 'transitory

[19] A scale effect is a spurious relation in the price model regression that can be used by failing to control scale that presumably exists among firms.

[20] Value- relevant events observed by the market in the current period and reflected in the current returns may not be recorded in the current earnings because of the accounting principles such as conservatism, objectivity, and reliability.

earnings[21] (Ota, 2003). However, we recognize that there is a trade-off. Returns are stationary and are more likely to give less problematic estimations. The problem with returns, however, is that they may not be economically meaningful. Returns are payoffs to one unit of wealth and we therefore cannot differentiate between highly priced stock and low priced stock.

Following on from this last point, Kothari and Zimmerman (1995) claim that ‘while return and price models are economically equivalent (…) return models are econometrically less problematic. Estimates of earnings response coefficients are more biased when the return model is used as against the price and differenced–price models’ (p.2). Moreover, Kothari and Zimmerman (1995) claim that even though a return model is preferred in general, the price models are ‘better specified in that the estimated slope coefficients from price models, but not return models, are unbiased’ (p.1). Furthermore, their results state that even the price model suffers more from econometric problems than return models; the price models' earnings’ response coefficients are less biased. Ota (2001) stated that although returns studies and levels studies are not econometrically equivalent they are economically equivalent since they are derived from the same source, which is the Ohlson (1995) linear information model. Furthermore, Rees (1999) explains in his paper that there are some difficulties that can be expected in the return model and these problems can be avoided by using the price models.

Previous studies have used mainly annual returns as a dependent variable (e.g. Biddle *et al.*, 1997: Barth *et al*., 2001; West and Worthington, 2000; Ismail, 2006). This research will fill this gap and contribute to the debate by adopting both price and return models in which price and return will be used as a dependent variable in the multivariate regression model to examine the relevancy of investigated performance measures.

3.2.1.1 The Information Content Model

Following the descriptive analysis of previous literature this research progresses to the next step which is the building of econometric models that will be used to test the hypothesis of the current study. This is based on Biddle’s *et al*. (1997) model that examines the association between selected performance measures and annual stock returns.

[21] Earnings contain transitory components such as special and extraordinary items.

Using a sample of 219 firms over the period 1984-1993, Biddle *et al*. (1997) test whether EVA and residual income (RI) outperform earnings and operating cash flows in explaining annual stock returns. They also try to test whether the components unique to EVA and/or RI help explain contemporaneous stock returns beyond that explained by operating cash flow (CFO) and earnings.

In order to test for the information content of the suggested performance measures, Biddle *et al*. (1997) use the slope coefficient approach to examine the statistical significance of their study variables in the following OLS regression:

$$D_t = b_0 + b_1 \frac{FE_{xt}}{MVE_{t-1}} + \varepsilon_t \qquad (3.1)$$

where D_t is the abnormal or unexpected returns for the time period *t*, b_0 and b_1 are the intercept and the slope coefficient of the regression model respectively, FE_{xt}/MVE_{t-1} is the independent variable which represents the unexpected realization for a given performance metric x (e.g., CFO, EBEI, RI or EVA), all the independent variables are scaled by the market value of the firms' equity at the beginning of the period; and ε_t is the error term.

Biddle *et al*. extended their original model 1 by introducing the one-lag version (lagged measure of accounting performance) for explanatory variables, which is considered 'a more convenient form that allows the slope coefficient b_1 to be observed directly rather than being derived from separate coefficients on levels and change models' (Biddle *et al*., 1997, p.9).

$$D_t = b_0 + b_1 \frac{FE_{xt}}{MVE_{t-1}} + b_2 \frac{FE_{xt-1}}{MVE_{t-1}} + \varepsilon_t \qquad (3.2)$$

Biddle *et al.* use R^2 to assess the relative information content. They build six pairwise comparisons among the accounting performance measure and the test is constructed as a comparison of R^2 of these pairwised sets.

The findings of Biddle *et al.* (1997) reveal that all the variables (EVA, RI, CFO, and EBIT) are significant (in explaining returns) at conventional levels and both EBIT and RI have the higher adjusted R^2 among other explanatory independent variables and outperformed EVA in explaining variation in stock return. Thus, this study does not support the Stern and Stewart (1991) claim that EVA has greater information content than earnings.

Along the same lines, in a study based on a sample of 110 Australian companies over the period 1992 to 1998, West and Worthington (2000) examined the association of EVA, earnings, net cash flows, and residual income with annual stock return and extended their research to test whether EVA has incremental information content and outperformed conventional accounting-based measures. They adopt the same methodology as Biddle *et al*. (1997) and examine the linkage between the competing different measures of firm performance. However, unlike previous empirical research they use the pooled time series and cross-sectional least squares regression to conduct their research. They introduce the following model to test for the relative and incremental information content of the competing measures:

$$MAR_{it} = b_0 + b_1 EVA_{it} + b_2 EBEI_{it} + b_3 CFO_{it} + b_4 RI_{it} + \varepsilon_{it} \quad (3.3)$$

where MAR_{it} the dependent variable, is the three months compound annual stock returns following the fiscal year end. The three months following the firm's fiscal year end is chosen to allow time for information contained in the annual report to be impounded in market prices, b_o is the intercept, EVA_{it} is the economic value added, $EBEI_{it}$ is earning before non-recurring items, CFO_{it} is operating cash flows, RI_{it} is residual income, and ε_{it} is the error term. All the variables included in this model are expressed per share.

The findings of West and Worthington (2000) indicate that, as with Biddle's *et al* study, all the performance measures have a significant association with the adjusted annual stock return variation. It also indicates that EVA has the lowest association with the variation in the adjusted stock return whereas EBEI outperforms the rest of the accounting measures in explaining the variation.

Mashaykhi (2009) in an analysis of 408 Iranian companies' data for the period 1998 to 2003 investigated the relevance and the incremental information content of cash value added (CVA) and value added (VA) beyond that already existing on earnings (E) and cash flow from operating (OPC). She used the OLS regression to test her study's hypothesis.

In the literature, value added is defined as the activities that are performed by the company and its employees to create value and increase the wealth of the entity shareholders. Thus, the value added is equal to sales less the cost of bought goods and services (Riahi-Belkaoui, 1993). Accordingly this definition leads to two methods to calculate the value added (VA): the descriptive (subtractive) and additive method:

The Descriptive Method: VA = S – M

The Additive Method: VA = W +I+ DP+ DD+ T+ RE

where S represents sales revenue; M, materials and services purchased from outside the firm; W, wages; I, interest; DP, depreciation; DD, dividends; T is tax expense and RE, retained earnings.

The above two methods illustrate that accrual items are included in the calculation of value added. Hence, the new accounting concept introduced is called cash value added (CVA) which represents the value added that was received or paid in cash.

CVA is computed by the same method used for the computation of value added:

The Subtractive Method: CVA = CS – CM

The Additive Method: CVA = WP +IP+ DDP+ TP+ OCF

where CS represents cash sales; CM, cash payment against material and service; WP, wages paid; IP, interest paid; DDP, dividends paid; TP, tax payments; and OCF, operating cash flow.

Biddle *et al.* (1995) state that there are two types of information contained in accounting numbers: the incremental information content and the relative information content. The relative information content describes the degree to which a specific measure has greater information content than other measures and applies when intending to choose among alternatives or when ranking by information content is required. Whereas the incremental criterion asks whether a specific measure has more information content than that already existing in other measures and applies when intending to assess measures with regard to other measure incremental information content. This research will apply the same methodology to test whether any of the investigated performance measures has more information content than already exists in other performance measures. In other words the incremental and relative information content of X, Y (any two performance measures) can be depicted by:

Relative information content:

Information content of X $\geq or <$ Information content of Y

Incremental information content:

Information content of X, Y $\geq$ Information content of X

Information content of $X_1,\ X_2 \geq$ Information content of Y

where X and Y refer to any paired performance measures of the set introduced by me, that is: net income (NI), earnings before interest, tax, depreciation and amortization (EBITDA), earnings before non-recurring items (EBEI), cash flows from operations activities (CFO), economic value added (EVA), and cash value added (CVA).

Hejazi and Maleki (2007) used the cash value added (CVA) concept as it was defined by the Boston Consulting Group where they considered CVA as an adjustment of cash flow return on investment (CFROI), and in order to generate value, companies should increase Cash Flow Return on Investment and grow the Gross Investment base. Hence, the following method will be used to calculate CVA:

$$CVA = (CFROI - WACC) \times Gross\ investment$$

where CVA is cash value added. CFROI = (Gross Cash Flow- Economic Depreciation)/ Gross Investment. WACC is the weighted cost of capital. Gross Investment = Net Current Assets + Historical initial cost.

Finally, owing to the scarcity of information available regarding CVA in Tehran's stock market (TSM), CVA added will be calculated according to:

$$CVA = OCF - PAID\ TAX - (INTEREST + DIVIDENDS)$$

After running the above regression (Hejazi and Maleki, 2007) concluded that both CVA and P/E have a positive and significant relation to annual stock return at the 0.05 level of significance. The significance relation also holds when the two variables are paired together within one regression model. The findings of this research reveal that CVA is better at explaining changes in stock returns than P/E, and it indicates that CVA has the higher incremental information content. For the purposes of the current research CVA is defined as:

$$CVA = OCF - OCFD$$

where CVA is cash value added, OCF is the cash flows from operations, and OCFD is operating cash flow demand equal to dividends and interest.

Similarly, Mashaykhi (2009) adopts the aforementioned distinction between relative and incremental information content and used a linear valuation model in expressing the relationship between change in price and earnings (E), operating cash flow (OCF), cash value added (CVA) and value added (VA) where she introduced the following models:

$$R_{it} = a_0 + a_1 \frac{\Delta x_{it}}{x_{it}} + e_{it} \qquad (3.4)$$

where R_t is the return adjusted for cash dividends, stock dividends, and new stock offerings (the adjusted market return), the coefficient of determination, Δx_{it} is the change in independent variables (e.g., E, OCF, CVA , and VA), R^2 (R^2VA, R^2CVA, R^2E, and R^2OCF) is the technique used by Mashaykhi to test for the relative and incremental information content of her study variables. The tool she used to rank the investigated performance measures in regard to their relative information content is the adjusted-R^2. Thus, the higher the adjusted-R^2 is the higher the information content. For the incremental information content purpose, the rule is that if the inclusion of a new performance measure increases the old R^2 then the performance measure is said to have more (incremental) information content beyond that already existing in the old one. However, it should be pointed out here that it is well known that adding more explanatory variables always results in an increase in R^2. Therefore, a more appropriate measure would be the adjusted R^2 which takes into account the number of additional regressors.

Finally, Mashaykhi (2009) concludes that there is a significant relationship between value added and annual stock returns where the cross–sectional regression shows unstable coefficient overtime. For the cash value added the result shows an insignificant relationship between cash value added (CVA) and annual stock returns on both pooled and cross–sectional data. Moreover, the explanatory power is quite low.

In the same vein, Ismail (2006) uses panel data regressions in order to investigate whether the EVA is superior to other performance measures in explaining variation in stock returns. Unlike the previous study (restricted to US data) the UK data over the period 1990 to 1997 were used to conduct this research (Ismail, 2006). However, unlike Biddle *et al.* (1997) Ismail used both the fixed effects model (FEM)[22] and the changes model (in which the lagged variable of performance measure is included) to conduct his research. In testing performance measures the interest is generally on the cross sectional behavior rather than the time series behavior. In other word, the current research is interested in why a firm is 'on average' better than another in terms of a given performance measure. Thus the following regression models were used to test for the information content of EVA and the various performance measures:

$$R_{it} = b_{0i} + b_1 \frac{X_{it}}{MV_{it-1}} + \varepsilon_{it} \quad \text{….. The fixed effects model} \quad (3.5)$$

$$R_{it} = b_{oi} + b_1 \frac{X_{it} - X_{it-1}}{MV_{it-1}} + \varepsilon_{it} \quad (3.6)$$

The findings of Ismail (2006) are consistent with Biddle *et al.* in that the net operating profit after tax (NOPAT) and net income (NI) outperform both EVA and RI in explaining variation in stock returns. Moreover, the first difference regression model (the independent variable $\Delta X = \frac{X_{it-} X_{it-1}}{MV_{it-1}}$) results confirmed that EVA does not outperform earnings.

However, one common feature of the aforementioned evaluating models is that they only consider the valuation components of Ohlson's model and ignore the most important variable namely the book value. Ohlson simply suggested that the book value (BV) reflects the available value- relevant information of equity. Consequently we extend the work of Biddle by adding the book value as an explanatory variable to our valuation model that is:

$$Mv_{it} = \beta_0 + \beta_1 Bv_{it} + \beta_2 X_{it} + \varepsilon_{it} \quad (3.7)$$

where Mv_{it} is the market value of company *i* in *t* time, X_{it} is any performance measure and ε_{it} is the error term and all the variables deflated the initial period share price. The market value is simply defined as the amount we obtained from multiplying the

[22] The fixed effects model allows the intercept to vary across firms (but not across time),

outstanding share by the market closing price, hence when deflating the variables by the initial share price the dependent variable, the market value, will equal the price (P).

Regarding the information content hypothesis (H_{01}) and based on the methodology adopted by Biddle *et al.* (1997), West and Worthington (2000) and Ismail (2006) the following regression model will be used to assess the information content of the explanatory variables of the current study:

$$P_{it} = \alpha_0 + \alpha_1 Bv_{it}/P_{t-1} + \alpha_2 X_{it}/P_{t-1} + v_{it} \qquad \text{(Model 1)}$$

The assessment is executed by conducting six separate regressions for each performance measure, where Bv_{it} represents the book value, X_{it} represents any accounting performance measure (NI, EBITDA, EBEI, CFO, EVA, and CVA), *t* is the time period, α_1 is the coefficient of the performance metric, P_{it} is the three month closing share price following the reporting date, (NI) is net income, (EBITDA) is earnings before interest, tax, depreciation and amortization, (EBEI) is earnings before non-recurring items, (CFO) is cash flow from operating, P_{t-1} is the beginning period market price, (EVA) is economic value added, (CVA) is cash value added, and ε_t is the error term. All variables are deflated by the number of outstanding ordinary shares at the end of period (t).

3.2.1.2 The Incremental Information Content Model

The incremental information content which exists between competing measures of firms' performances, has received a great deal of attention in the literature (Wilson, 1986; Ball and Brown, 1987; Board and Day, 1989; Ali, 1994; Biddle *et al.*, 1995). Biddle *et al.* (1997) replicated the methodology used by Bowen *et al.* (1987) to assess the incremental information by examining the statistical significance of regression slope coefficients.

To conduct their test, Biddle *et al.* adopted the one lagged regression model that generalizes to any two selected accounting performance measures X and Y that is:

$$D_t = b_0 + b_1 \frac{X_t}{MVE_{t-1}} + b_2 \frac{X_{t-1}}{MVE_{t-1}} + b_3 \frac{Y_t}{MVE_{t-1}} + b_4 \frac{Y_{t-1}}{MVE_{t-1}} + \varepsilon_t \qquad (3.7)$$

where D_t is the dependent variable which represents any measure of returns such as abnormal returns, X_t, Y_t and X_{t-1}, Y_{t-1} are any two performance metrics and their one year lag value respectively, b_0 is the constant and b_0 , … b_4 are the regression coefficients and ε_t is the error term. All variables are deflated by the beginning year market value MVE_{t-1}.

The incremental information content of different performance measures is assessed by examining the statistical significance of the regression equation generalized to any two pairwise accountings measures, where F- test and a comparison between R^2 of the joint measures and the R^2 of the single measure will be the indicator of any incremental information content. Thus, the regression model that applied in the current study to test for the incremental information content is:

$$P_{it} = \alpha_0 + \alpha_1 Bv_{it}/P_{t-1} + \alpha_2 X_{it}/P_{t-1} + \alpha_3 Y_{it} /P_{t-1} + v_{it} \qquad \text{(Model 2)}$$

where Bv_{it} represent the book value, P_{t-1} is the beginning period market price, X_t and Y_t represent a pairwise combination from the set of performance measures: NI, EBITDA, EBEI, CFO, RI, EVA, and CVA. Rejection of the null that $\alpha_2 = 0$ is taken as evidence in favour of the incremental information content of Y relative to X.

3.2.2 Earnings versus Earnings' Components

Earnings as a performance measure are a better exponent of variation in annual stock price performances than cash flow measures. The main difference between cash flows and accrual earnings is the accrual adjustments can be seen numerically (Dechow, 1994):

Accrual earnings = Cash flows + Accrual adjustments.

Thus any difference between cash flows and earnings is due to accruals, which is exposed to management manipulation. Management's discretion makes accruals unreliable and not a perfect predictor of a firm's performance. On the other hand, the accrual process is necessary to comply with revenue recognition and matching principles. The former requires companies to recognize the revenue when it has performed all, or a substantial part of it, whether received or not (Dechow *et al.*, 1995). The matching principle requires firms to report all the expenses associated with revenues in the same period whether paid or not. Hence, the accrual process is a trade-off between reliability and relevance (Dechow, 1994, 1989; Watts and Zimmerman, 1986).

Cash flow measures avoid management manipulation but at the same time suffer from matching and timing problems. However, other accounting conventions have restricted management manipulation such as objectivity, verifiability and the use of historical cost (Dechow, 1994; Watts and Zimmerman, 1986). Therefore, earnings suffer less from management manipulation while cash flows still suffer from its inherent matching and timing problems.

As shown in Chapter 2, there is no agreement on the performance of various accounting measures. While some studies show that earnings are the best predictor for future cash flows (Dechow, 1994; Dechow *et al.*, 1998; Borad and Day, 1989; Ali and Pope, 1995; Clubb, 1995), others provide evidence on the incremental information content for cash flows (Bowen *et al.*, 1986 and 1987; Barth *et al.*, 2001).

Following Dechow (1994), Charitou and Clubb (1999) used UK data over the period 1985 to 1992 to examine the relationship between security returns, cash flows and earnings. They assessed this relation using different intervals: one year, two years and four years. They developed Dechow’s method by examining the incremental information content of accounting earnings and cash flow measures. In addition, they added new variables in their study. Using univariate models, they examined the information content for earnings, operating cash flows, change in cash, and equity cash earnings. Their results show that earnings had the highest propensity to explain the variation in stock return. They also found that the operating cash flows and change in cash had information content in explaining the variation in stock returns while the equity cash earnings revealed a weak relation with stock returns. Moreover, their results indicate that the adjusted R^2 increased as they extended the measurement interval which is consistent with Dechow (1994).

Dechow *et al.* (1998) stated that ‘Since the difference between earnings and cash flows is accruals, earnings’ forecasting power beyond cash flows is attributable to accruals’ (p. 152). Mcleay *et al.* (1997) analysed UK data and reported that the components of accruals, namely the short and long term, have incremental information content beyond that already existing in aggregate earnings. Therefore, the decomposition of earnings into aggregate accruals and cash flows will unmask the information content in aggregate accruals. This can be expressed in the following hypothesis:

> H_{03}: Earnings components have no statistically significant effect on annual stock price performance.

This hypothesis is tested by looking at the restriction: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$ in model 3 below where earnings are equal to cash flows plus accruals (Barth *et al.*, 2001):

Earnings = CF+ Accrual

= CF + ΔAR + ΔINV- ΔAP- DEP-AMORT + OTHER

Biddle *et al.* (1997) in a study of the usefulness of EVA in the US context suggest that "an avenue for future research suggested by the findings of this study is to examine more closely which components of EVA and earnings contribute to, or subtract from, information content" (p. 333). In addition Barth *et al.* (200l) state that earnings can be disaggregated into the following major components: change in accounts receivable (ΔAR), change in accounts payable (ΔAP), change in inventory (ΔINV), depreciation (DEP), amortization (AMORT) and other accruals (OTHER). This study will adopt the following regression model that examines the information content of earnings components:

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 CF_{it} + \alpha_3 \Delta AR_{it} + \alpha_4 \Delta AP_{it} + \alpha_5 \Delta INV_{it} + \alpha_6 DEP_{it} + \alpha_7 AMORT_{it} + \alpha_8 OTHER_{it} + \varepsilon_{it} \qquad (Model\ 3)$$

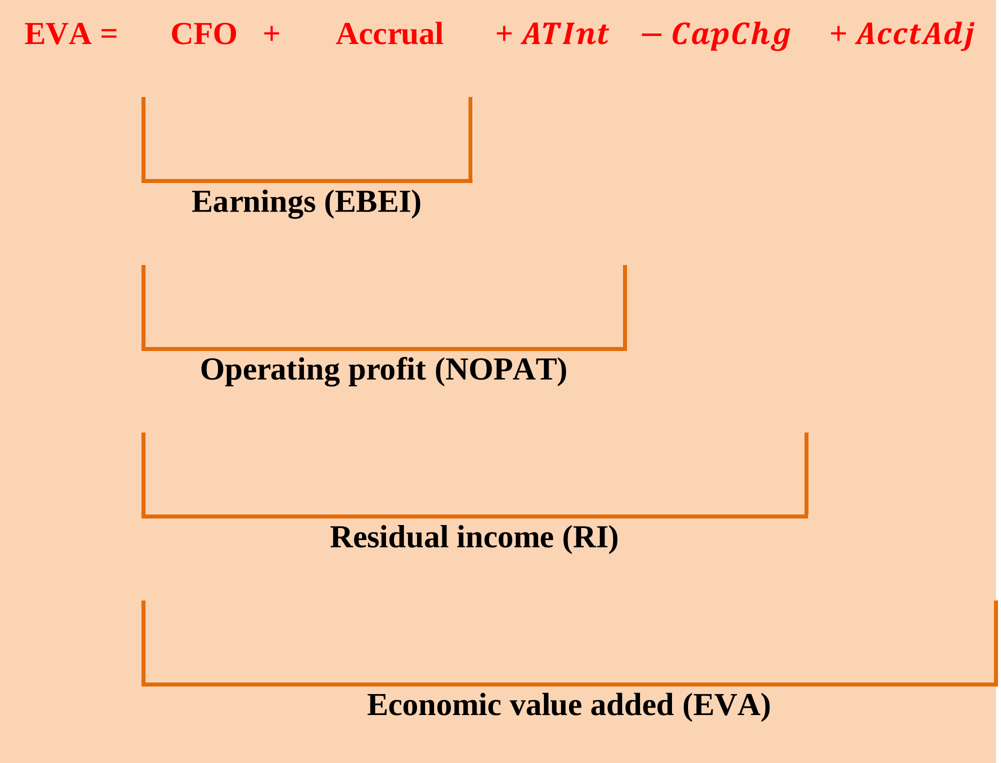
where BV_{it} is the book value at the beginning of the operating year, CF is the cash flow and other accruals = Earnings – (CF+ ΔAR + ΔINV- ΔAP- DEP-AMORT). This decomposition is an attractive feature of earnings to reveal the source of changes in stock return.

3.2.3 EVA versus EVA's Components

As far as EVA versus EVA's components are concerned, Biddle *et al.* (1997) extend their research to investigate whether the economic value added (EVA) outperforms, and has incremental information content beyond that of accrual earnings. They also extend their investigation to test whether any of EVA's components has a higher association with stock return and a firm's value.

To address this incremental information content issue, Biddle *et al.* decompose EVA into its main components and evaluate the contribution of each component toward explaining variation in stock returns. They begin their test by describing the linkage between the main variables of their study: cash flow from operations (CFO), earning before non-recurring items (EBEI), residual income (RI), and economic value added (EVA). They then decompose EVA into its main components. The following diagram depicts this relation.

Figure 3.1: Components of Economic value added (EVA)



Source: Biddle *et al.* (1997)

As far as the incremental information is concerned, the results of Biddle *et al.* (1997) show that the F-statistics suggest that CFO and Accrual far and away make the largest incremental contributions to explaining market-adjusted returns, while after tax interest (ATI), capital charge (CapChg) and Accounting adjustment (AcctAdj) exhibit much smaller incremental contributions. The accounting adjustments (AcctAdj) refer to the adjustment suggest to NOPAT and IC (invested capital) by Stern & Stewart in order to calculate the EVA. The main and common introduced adjustments are: the effects of research and development expenses capitalisation, the effects of LIFO reserves, the deferred taxes, the provision effects and the good will amortization (Young, 1999). When combined with the relative information content findings, Biddle *et al.* suggest that while EVA components offer some incremental information content beyond earnings components, their contributions to the information content of EVA are not sufficient for EVA to provide greater relative information content than earnings. Building on the above, the following hypothesis is developed to test whether any of EVA's components contribute significantly to the association between EVA and stock price performance.

H_{04}: EVA components have no statistically significant effect on stock price performance.

This hypothesis is tested by looking at the restriction: $\alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = 0$ in 'model 4' bellow where EVA is:

$$EVA = CFO + Accrual + ATI - CapChg - AcctAdj$$

The incremental information content comparisons assess whether one measure provides value-relevant data beyond that provided by another measure and whether they apply when assessing the information content of a supplemental disclosure or the information of a component measure (Bowen *et al.,* 1987).

In their response to Stewart's (1991) claim that EVA is the best performance measure regarding its ability to capture the true economic profit of a firm and following the recommendation of Biddle *et al.* (1997), West and Worthington examined which of the components of EVA and earnings were more likely to contribute to, or subtract from, the information content.

The second phase of West and Worthington's study (the first phase was discussed in Section 3.1.1.1) was to examine the components of EVA. Their results convey that all the variables are significant where operating accruals (ACC) have greater explanatory power among other variables. Further, the component in EVA that explains most variation in stock returns is accrual. West and Worthington use the following model to test for the incremental content between EVA's components:

$$MAR_{it} = b_o + b_1CC_{it} + b_2ATI_{it} + b_3ACC_{it} + b_4ADJ_{it} + b_5NCF_{it} + e_{it} \qquad (3.8)$$

where MAR_{it} is the compound annual return, CC is the cost of capital (Invested capital at time t-1 (IC) × the firm's weighted average cost of capital (WACC), ATI is the interest after tax, ACC is the operating accruals (EBEI- NCF), ADJ is the accounting adjustments and NCF is the net cash flows. For the incremental information content the results show that the most logical pairing of information variables in explaining market return is composed of EBEI and EVA.

To test for the incremental information content of EVA components and to evaluate which components of EVA, if any, contribute to the association between EVA and stock price performance, the Biddle *et al.* model is replicated. Biddle *et al.* (1997) decomposed EVA into four major components: cash flows from operations (CFO), after tax interest (ATI), operating accruals (ACC), capital charge (CC), and accounting adjustments (AcctAdj). Hence, the regression model is:

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 CFO_{it} + \alpha_3 ACC_{it} + \alpha_4 ATI_{it} + \alpha_5 CC_{it} + \alpha_6 AcctAdj_{it} + \varepsilon_{it}$$

(Model 4)

Unlike Biddle *et al.* (1997) the current study will use a panel data fixed effects model to examine the association between EVA's components and the stock price performance.

Various papers have analyzed the conceptual advantages and disadvantages of price and return models. Gonedes and Dopuch (1974) claim that return models theoretically outperform price models in the absence of well-developed theories of valuation. Lev and Ohlson (1982) consider the two methods as complementary, whereas Landsman and Magliolo (1988) argue that for specific applications price models are superior to return models. Christie (1987) concludes that while return and price models are economically the same, return models are econometrically less problematic.

Despite the criticism the price models have faced, they persist. The empirical result of Kothari and Zimmerman (1995) confirm that the price models' earnings' response coefficients are less biased. However, return models have less serious econometric difficulties than price models. In some research contexts the combined use of both price and return models may be useful and seem to be the best models to follow. In terms of the results and methods used by Christie (1987), Kothari and Zimmerman, and Ota (2003), the data from the UK stock market is used to compare the results obtained from adopting price and return models as a tool to examine the information and incremental information content of a set of different performance measures. The return models are:

$$R_t = \alpha_0 + \alpha_1 \frac{x_t}{MVE_{t-1}} + \varepsilon_t \qquad \text{(Model 5)}$$

$$R_t = \alpha_0 + \alpha_1 \frac{x_t}{MVE_{t-1}} + \alpha_2 \frac{y_t}{MVE_{t-1}} + \varepsilon_t \qquad \text{(Model 6)}$$

where R_t is the stock return, x_t, y_t are any two performance measures, and all the independent variables are deflated by the market value of equity at the beginning of the fiscal year ($\mathrm{MVE_{t-1}}$).

3.3 Hypothesis testing

The comparison between the ability of the four models in explaining the variation in annual stock price and stock return is the basic approach to test the hypotheses of the study. The models' goodness of fit is considered the main criterion to distinguish between any differences in explaining variation in annual stock prices. The increase in adjusted R^2 is implied that the added variables have information content and vice versa. In addition, the significance of the variables' coefficient is taken into consideration to formulate a judgment on variables' usefulness.

3.4 Variable Measurement and Definition

In order to examine the ability of a set of performance measures in explaining changes in stock price (return) performances, the variables used in the models of this research are extracted from income statements and cash flow statements. These variables are taken from the financial database, DataStream, FAME, and OSIRIS.

The dependent variable in all the models in this study is P, which is the three-month share closing price following the reporting day. The annual return and abnormal return have been extensively used to study the information content of different performance measures (Biddle *et al.*, 1997; West and Worthington, 2000; Ismail, 2006). In response to the claims raised by Rees (1999), Kothari and Zimmerman (1995) and Christie (1987) regarding the potential limitations of the return model, this research tries to contribute to the existing UK literature by adopting the price model and the return model to test for the information content and incremental information content of performance measures.

The explanatory variable (X_i) is the realization of certain performance measures over the same period *t*, these independent variables are defined as follows[23]:

- NI or E: net income or earnings available to ordinary shareholders (WC01751).
- EBITDA: earnings before interest, tax, depreciation, and amortization (WC18198).
- EBEI: earnings before extraordinary items (WC01551).
- CFO: net cash provided by operating activities (WC04860).
- EBIT: earnings before interest and tax (WC18191).
- EVA: economic value added calculated as:
  $NOPAT_t - IC_{t-1}$ × WACC (the firm's cost of capital)
- CVA: cash value added is calculated as: CFO – OCFD (operating cash flows demand - dividends and interest (WC01251)).
- ∆AP: the annual change in annual accounts payable that shows the increase and decrease in creditors during the year (WC03040).
- ∆*INV*: the annual change in inventories (WC02101).
- ∆*AR*: the annual change in accounts receivable (WC02051).
- *DEP*: annual depreciation on tangible assets (WC01148).
- OTHER: represents other accruals. It is defined as follows:
  NI– (OCF+∆AR+∆INV-∆AP-DEP)
- Accrual: operating accruals defined as: EBEI – CFO
- ATI: the interest after tax computed as: interest expense (WC01251) × (1- Tax rate) (WC08346).
- CC: is calculated as: IC_{t-1}(invested capital) × WACC
- IC: invested capital (capital employed) which is equal to the sum of the common shareholders' equity (WC03501) and long-term debt (WC03251).
- NOPAT: is the net operating profit after tax calculated as net operating profit (WC01250) × (1-Tax rate).

In order to calculate the economic value added (EVA), the cost of equity (r_i), the cost of debt (r_d) and the weighted average cost of capital (WACC) should be estimated first. The cost of equity is calculated using the capital pricing model (CAPM) where the cost of equity is equal to:

[23] Code between brackets represent the variables mnemonic ID used by DataStream database to trace variables among different time horizons.

$$r_i = r_f + \beta_i(r_m - r_f)$$

Where r_i refers to the rate of the return expected by the shareholder, r_f is the rate of return for risk- free security, β_i[24] represents risk of individual security and $r_m - r_f$ is the market premium. The weighted average of the cost of capital is then calculated by adopting the following formula:

$$WACC = (E/V \times r_i) + (D/V \times r_d) \times (1 - T_c)$$

where E is equity, V is market value, r_i is cost of equity, D is debt, r_d is the cost of debt which is calculated by dividing the interest and expenses the company incurred to obtain loans by the total debt and T_c is the tax rate.

For the purpose of the current research and to conduct the empirical analysis employed here, earnings are defined as net income- the net income that is available to the common shareholder. Specifically, this includes extraordinary items and income from discontinued operations. This definition is inconsistent with the definition employed in most US studies (e. g. Barth, *et al.*, 2001). The question which may create some concern is whether or not the general findings of such studies are unduly sensitive to earnings definitions?

Dechow (1994) studied this issue and investigated the impact of one-off changes on the relationship between earnings changes and stock returns. She found that the inclusion of such one-off changes reduces the association, and therefore it makes sense for extraordinary items and discontinued operations to be excluded from any earnings definition employed here. However, it should also be noted that while Dechow finds that variations in earnings definitions may have some impact on the strength of the association it does not affect the direction (i.e. the sign) of the relationship. Hence, positive associations are reported across all test periods.

In a similar vein, the UK study by Charitou, *et al.* (2001) examines the issue of the earnings definition with regard to its association with stock returns. They defined earnings as net income before extraordinary items, discontinued operations, and special and non-operating items. Their main analysis employs a measure of operating earnings from the Global Vantage database. However, they go on to note that "This earnings

[24] I used the 60 days stock price method to calculate the missing companies' Betas.

variable differs slightly from that used by ... [US researcher]. We re-ran several regressions using an earnings before extraordinary items variable broadly comparable to that used by ... [US researcher] and found no qualitative differences in our results" (p. 590).

In conclusion, Dechow (1994) and Charitou, *et al.* (2001) contend that minor differences in earnings definitions do not materially affect the direction of associations or the overall conclusions drawn from such studies.

3.4.1 Controlling Variables

It is useful to deflate some (or all) of the explanatory variables in the levels and returns model by a measure of size such as outstanding shares, sales, market or book value (Biddle *et al.*,1997; Dechow, 1999; Ismail, 2006). The stated objective of such deflation typically is to control for size in the error term.

Most econometric issues are those raised as a result of dependencies between the residuals (the error ε) in a regression equation and the included explanatory variables since they lead to biased and inconsistent estimators. Other difficulties such as Heteroscedasticity are efficiency issues. In this regard, problems related to the choice of deflator represent obvious evidence of unresolved econometrics problems in both levels (valuation) and return studies.

The correct deflator in the return model is the market value of equity at the beginning of the period. The advantages of solving the deflator problem in the return study are that the mismeasurement of expectations and the interpretation problems associated with different deflators are eliminated (Christie, 1987). Christie (1987, p. 233) stated that "there is no natural deflator in level models, but deflation by anything other than a function of independent variables can generate specification errors''.

Following prior research, all the independent variables of the current study are deflated by the number of outstanding shares at the end of the operating year when share price is the dependent variable (Garrod *et al.*, 2000) and deflated by the market values at the beginning of the period when the return model is adopted (Christie, 1987). The numbers of outstanding ordinary shares are obtained from the balance sheet statement as presented in the DataStream database.

3.5 Sample selection

The study sample consists of all non-financial UK companies listed on the London stock exchange (LSE) with available data for the period 1991-2011 (see Appendix No, 1). The exclusion of financial companies is due to the variation between the components of financial statements between financial and industrial firms. This exclusion is in line with all prior market-based-research studies. Rees (1997) claims that this is conventional as the relationship between accounting numbers and value is thought to be very different for financial entities compared to industrial and other financial firms. The data is not restricted to any firm size or fiscal year end date. Restricting the sample to the December year end makes the sample biased towards larger firms (Strong and Walker, 1993).

The empirical analysis of the current research uses both accounting and financial market information. I collect data from three sources. First, I use the firms' annual report where the financial statement is prepared and issued according to the international accounting standards (IAS). Thus, using the financial statement and the random selection of firms will fulfil and enhance the reliability and validity criteria of our sample. Second, the DataStream financial database is used to collect annual accounting information on this research variable. Third, I have used the London Share Price Database (LSPD) to collect data on monthly share prices and returns. Inclusion of entities in the sample required satisfying underlying criteria. First, the annual accounting should be available in the DataStream database for the selected period. Second, stock prices and returns have to be available in LSPD. Finally, firms should have a positive book value (BV). The exclusion of firms with negative a book value is due to the fact that firms with negative BV have different approaches for valuation than those with a positive BV. Overall, the negative BV will affect the value of the coefficient in the model used, thus, the results will be biased in those firms. A third point could be that a negative BV means that the firm is in distress, thus, the results will be affected by distress risk.

3.6 Summary

This chapter has described the research design and the methodology used to achieve the research objectives. It has outlined the research design starting with performance measurement practices in terms of classification, implementing the value-based model, and how to measure the performance. There is a discussion of the research design of the explanatory variables in terms of the research questions and how to define and measure these measures.

The chapter has formulated the research hypotheses and the theoretical framework of the research developed according to the literature and the research objectives. The purpose of this research is to examine traditional and recently developed performance measures and to compare these measures with the market's assessment of market performance, general talk, the stock's price and return.

The main research instruments have been discussed, including their conceptual advantages and disadvantages and two main valuation methods were used in this research to test UK data, namely, the price and return models. The price methods in which equity's price are regressed against a set of performance measures. In terms of the return model, the different performance measures are regressed against stock return.

Chapter 4
The Value Relevance of Performance Measures

4.1 Introduction

The purpose of this chapter is to report on the main body of results for the study. The value relevance and incremental information content of performance measures will be evaluated by assessing their ability to explain the variation in stocks performances. Because of the superiority of net income (NI) among the traditional measures and the heated debate around economic value added (EVA) this study will also examine the relative explanatory power of both the EVA and NI components. Previous chapters highlighted the theoretical background and provided the hypothesis for the current research. This chapter will empirically test the hypothesis that was earlier developed in chapter 3 on methodology.

The results I obtained show evidence that in the case of the UK the traditional performance measures dominate and outperform value added measures. Similarly, cash flows from operations (CFO), amortisation (AMORT), depreciation (DEP), changes in accounts receivable (ΔAR), changes in account payables (ΔAP), changes in inventory (ΔInv) and the other accruals (OTHER), the components of NI have provided more information than NI alone. In addition to the results showing that net cash flows from operations activity (CFO), accruals (ACCR), after tax interest (ATINT) and the capital charge (CAPCHG), the EVA components contained more information than the EVA itself.

The current chapter is divided into six main sections organised as follows: Section 4.2 describes the statistics. Section 4.3 provides empirical evidence on the relative information content of performance measures. Section 4.4 provides evidence on the incremental information content of performance measures and subsections 4.4.1 and 4.4.2 provide the results for the incremental information of NI and EVA components respectively. Section 4.5 provides the empirical results of the return model. Finally, the last section summarises the chapter.

4.2 Descriptive Statistics

In order to mitigate Heteroscedasticity and induce stationarity in the data, all independent variables are deflated by the outstanding share price at the beginning of each accounting period. Descriptive statistics of these deflated variables are provided in Table 4.2.1. Earnings before extraordinary items (EBEI) and NI have the lowest standard deviation among the seven performance measures. This is partially consistent with Biddle *et al.* (1997) who claim that the lowest standard deviation of EBEI is inconsistent with the "smoothing effects of accruals" (p.313). Market value (MV) and book value (BV) have the highest standard deviation and mean (4.75 and 2.76 respectively). BV has the largest mean among the independent variables followed by earnings before interest, tax, depreciation and amortization (EBITDA) and earnings before interest and tax (EBIT). CFO has a higher mean and standard deviation than NI. This is consistent with Dechow *et al.* (1998). The last two columns of Panel A show a further characterisation of the data: the skewness and kurtosis of the different performance metrics. After an examination of the results we notice that most of the variables are skewed to the right (positive skewness) apart from cash value added (CVA) and EVA which are skewed to the left. This is due to the long-run profitability concept of CVA and EVA. Because these two measures involve the cost of capital they are often negative when earnings are positive. In other words CVA and EVA reflect the fact that firms can be value destroying, in which case the observations of EVA and CVA take negative values. With regard to Kurtosis the results show that all measures have a peaked distribution reflecting the fact that some firms have extreme performances during the sample period.

Pair-wise correlation between variables is provided in Table 4.2.2. It is noticeable that all the variables have a positive and significant correlation. BV and EBITDA have the highest correlation with market value followed by EBIT and NI. CVA has the lowest correlation with MV. The result also indicates a perfect correlation with r equal to one between NI and EBEI. This is attributed to the fact that for most of the UK there have been no significant extraordinary items for many years which means NI is equal, or almost equal, to EBEI because the extraordinary items are too small to have a discernible effect. More importantly, the economic profit measures, CVA and EVA, have the lowest correlation with MV among the seven performance metrics. This is inconsistent with Chen and Dodd (1997) and Ismail (2006), who refute the claims of the EVA proponents that EVA is highly associated with a firm's value.

Table 4.2.1. Selected descriptive statistics on the dependent and independent variables / pooled data.

Variables	N	Minimum	Maximum	Mean	SD	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
MV	7208	0.000	94.300	2.755	4.748	6.452	0.029	66.134	0.058
BV	7222	0.000	76.605	1.911	3.861	8.612	0.029	107.475	0.058
NI	7222	-14.550	15.477	0.179	0.667	1.507	0.029	155.965	0.058
EBITDA	7160	-14.532	24.687	0.429	0.965	5.230	0.029	119.203	0.058
EBIT	7179	-14.532	24.590	0.326	0.893	5.647	0.029	155.092	0.058
EBEI	7222	-14.550	15.477	0.181	0.668	1.502	0.029	155.772	0.058
CFO	5347	-18.042	83.757	0.296	1.442	36.831	0.033	2143.255	0.067
CVA	7222	-214.271	18.634	-1.040	7.894	-11.332	0.029	169.976	0.058
EVA	7222	-22.250	19.802	0.076	0.849	-0.439	0.029	155.864	0.058
N (List wise) 7222									

MV is the market value of firm's equity, BV is book value, NI is net income, EBITDA is earnings before interest, tax, depreciation and amortization, EBIT is earnings before interest and tax, EBEI is earnings before extraordinary items, CFO is cash flows from operations, CVA is cash value added and EVA is economic value added.

Table 4.2.2 Pair-wise correlation for all the variables

	MV	BV	NI	EBITDA	EBIT	EBEI	CFO	CVA	EVA
MV	1								
BV	.763**	1							
NI	.473**	.474**	1						
EBITDA	.611**	.620**	.919**	1					
EBIT	.582**	.607**	.946**	.986**	1				
EBEI	.473**	.474**	1.000**	.919**	.947**	1			
CFO	.201**	.222**	.358**	.416**	.403**	.358**	1		
CVA	.031**	.026*	.053**	.062**	.058**	.053**	.042**	1	
EVA	.196**	.096**	.295**	.344**	.337**	.295**	.366**	.029*	1

Note: The sample has 7222 firms' year observations. All variables are expressed per outstanding shares. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). MV is the market value of firm equity, BV is the book value, NI is the net income available for the common, EBITDA is the earnings before interest, tax, depreciation and amortisation, EBIT is the earnings before interest and tax, EBEI is the earnings before extraordinary items, CFO is the net cash flows from operations activities, CVA is the cash value added, and EVA is the economic value added.

4.3 The Relative Information Content of Performance Measures

Table 4.3.1 depicts the estimated coefficients and R^2 of the fixed effects valuation model where the dependent variable is specified as a firm's market value three months after the fiscal year end and explanatory variables are variously specified as net income (NI), earnings before interest, tax, depreciation and amortization (EBITDA), earnings before interest and tax (EBIT), earnings before extraordinary items (EBEI), cash flows from operations (CFO), cash value added (CVA)[25] and economic value added (EVA).

The relative information content is assessed by comparing the adjusted R^2 that is obtained from the 7th separate regressions - one for each performance measure. We estimated the panel data regression to be based on equation Eq. (1): $MV_{it} = \beta_0 + \beta_1 Bv_{it} + \beta_2 X_{it} + \varepsilon_{it}$. The p-values of the fixed effects model from the two-tailed statistical tests of relative information content are shown in the last row.

The results in Table 4.3.1 below report the relative information content of the non-deflated explanatory variables. Observing the p-values of the fixed effects model, each of the seven variables is significant at conventional levels, which implies that the null hypothesis of no fixed effects cannot be accepted. Therefore the use of the fixed effects model is statistically justified. Regarding value relevance, the results indicate a significant difference in relative information content with CFO having a significantly higher adjusted R^2 (= 91.70%) than each of the other six variables This is consistent Ball and Brown (1987) and Ali (1994) and might be attributed to the fact that the users of accounting information have more confidence in CFO compared with other traditional performance (NI and EBITDA). CFO is harder to fudge or manipulate by top managers while the latter are highly vulnerable to manipulation as the accounting and GAAP standards allow managers a range of treatment choices when it comes to reflecting accounting transactions. The difference in significance might also be attributed to the fact that the inclusion of book value (BV) into the regression model will capture some of the accruals information content.

The results also indicating that NI (R^2 = 85.02%), EBITDA (R^2 = 84.96%), EBEI (R^2 = 5.02%), and CVA (R^2 = 85.25%) are more highly associated with a firm's market value (MV) than EVA. In terms of international comparisons, this finding is strongly consistent with what was reported by Biddle *et al.* (1997), who stated that earnings

[25] The data on the CVA measure contains one outlier, and the following results on CVA should therefore be treated with caution.

before extraordinary items were more closely associated with stock returns (adjusted R^2 = 9.04%) and outperform EVA (adjusted R^2 = 5.07%). Our results also confirm the suggestion by West and Worthington (2000) that EBEI more effectively explains the compound annual stock market return (MAR) than EVA (R^2 = 23.67% for EBEI versus 14.29% for EVA). Furthermore, Chen and Dodd (2001) claim that the operating income (R^2 = 6.2%) dominates both RI (R^2 = 5.0%) and EVA (R^2 = 2.3%).

Table 4.3.2 presents the results of the value relevance of the performance measures after deflating the independent variables by the total outstanding share (*tos*) at the beginning of 1990. The coefficients of BV generated from a single regression of MV against the set of performance metrics are presented in the first column on the left of table 4.3.2. The value of the BV coefficient is very close to unity in all cases. This is consistent with the theoretical assumption, particularly Ohlson's assumption, that the relation between BV and MV is one-to-one. Consequently this assumption seems to hold. It can be noticed that after the deflation by the number of outstanding shares the adjusted R^2 decreases slightly by approximately 10% as do the coefficients of the performance measures. Another observation that can be made in the separate rankings for performance measures is that CFO still has the highest association with MV among the other measures (R^2 = 79.82%) and that EVA outperforms CVA in explaining the variation in stock performance (R^2 = 77.32% versus 76.00%). In sum, the results presented in Table B.4.3.2 suggest the following ranking of performance measures with regard to their value relevance: CFO (adjusted- R^2 =79.82%), EBITDA (adjusted- R^2 =77.90%), EVA (adjusted- R^2 =77.32%), EBIT (adjusted- R^2 =77.30%), (NI and EBEI (adjusted- R^2 =76.55%) and CVA (adjusted- R^2 =76.00%).

Table 4.3.1
Test results of the relative information content of independent variables using panel data fixed effects model
Undeflated Variables

Variables	BV	NI	EBITDA	EBIT	EBEI	CFO	CVA	EVA	R^2	F
Coefficient estimates	1.02	1.845***							85.02%	119.74
	0.92		1.248***						84.96%	118.09
	1.12			0.831***					84.52%	114.48
	1.02				1.846***				85.02%	119.72
	0.19					3.240***			91.70%	171.57
	0.88						1.874***		85.25%	121.94
	1.18							0.626***	84.93%	118.89
p-values	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation (1) $MV_{it} = \beta_0 + \beta_1 Bv_{it} + \beta_2 X_{it} + \varepsilon_{it}$ where MV_{it} is firm market value of equity three month after the reported date end; X_{it} is a performance measure (e.g. NI, EBITDA, EBIT, EBEI, CFO, CVA, EVA). In Panel A we report the results of the regressions where the independent variables are not deflated. In Panel B we report the results of the regressions where independent variables are deflated by the outstanding number of shares. The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the R^2 *and F- test* respectively.

Table 4.3.2

Test results of the relative information content of independent variables using panel data fixed effects model
Variables deflated by Outstanding Share Number

Variables	BV	NI	EBITDA	EBIT	EBEI	CFO	CVA	EVA	R^2	F (209.53)
Coefficient estimates	1.12	0.70***							76.55%	83.30
	1.03		1.13***						77.90%	89.27
	1.08			0.97***					77.30%	86.36
	1.12				0.69***				76.55%	86.89
	1.11					1.27***			79.82%	66.62
	1.18						0.06***		76.00%	80.69
	1.18							0.81***	77.32%	87.03
p-values	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0013	0.0000		

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation (1) $MV_{it} = \beta_0 + \beta_1 Bv_{\ it} + \beta_2 X_{it} \ / \ tos_{it} + \varepsilon_{it}$ where MV_{it} is firm market value of equity three month after the reported date end; X_{it} is a performance measure (e.g. NI, EBITDA, EBIT, EBEI, CFO, CVA, EVA). In Panel A we report the results of the regressions where the independent variables are not deflated. In Panel B we report the results of the regressions where independent variables are deflated by the outstanding number of shares. The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the R^2 *and F- test* respectively.

4.4 The Incremental Information Content of Performance Measures

The incremental criterion asks whether a specific measure has additional information content over that already existing in other measures and is applicable when intending to assess measures in regard to other performance measure's information content. The steps outlined by Biddle *et al.* (1995, 1997) and Charitou *et al.* (2001) were followed to assess the incremental information content of the different performance metrics. It was assessed by comparing the adjusted R^2 from a separate regression, one for each performance measure, and the adjusted R^2 from a combination of two different performance metrics.

Table 4.4.1 indicates that there is significant incremental information content existing between pairwise measures. The p-values in the last row show that the fixed effects model is more specified in favour of the random model and represents that in all cases the null hypothesis that the pairwised variables are jointly insignificantly different from zero (Biddle *el al.*, 1995). The first row shows the adjusted R^2 from the single variable regression for measure separately. For example, the first R^2 figure, 79.82%, is obtained by regressing the deflated market value against CFO. Apart from NOPAT, CFO has the highest explanatory power, which is consistent with Charitou *et al.* (2001) who used UK data over the period 1985–1993 to investigate the value relevance of operating cash flows and earnings where they claimed that operating cash flows revealed incremental information content beyond earnings when pooled data were used.

The rest of Table 4.4.1 provides the adjusted R^2 obtained from various pairwise combinations of performance measures. Each cell contains the adjusted R^2 from a bivariate regression involving the row head and the column head. Under this figure a smaller value is given in parenthesis. This is the increment in the adjusted R^2 obtained by adding the second variable. For example, when we use CFO and EBITDA we obtain an adjusted coefficient of determination of 80.73%. However adding EBITDA to CFO increases the R^2 by 0.91%, while adding CFO to EBIDTA increases it by 2.83%. Consistent with previous literature all the performance measures have, or contained more, information than other performance measures except for EBIT as, when paired with CVA, the adjusted R^2 decreased by 0.01.

Table 4.4.1

The Incremental Information Content of Performance Measures

Panel: A regression results using deflated variables		CFO	EBITDA	EVA	EBIT	NI	EBEI	CVA	NOPAT
Adjusted R² ***(single regression)***		**79.82%**	**77.90%**	**77.32%**	**77.30%**	**76.55%**	**76.55%**	**76.00%**	**80.70%**
Adjusted R² (pairwise combinations)	**CFO**		80.73%	80.36%	80.47%	80.13%	80.13%	79.86%	82.01%
			(2.83%)	(3.04%)	(3.17%)	(3.58%)	(3.58%)	(3.86%)	(1.31%)
	EBITDA	80.73%		78.93%	79.86%	78.89%	78.89%	77.91%	80.70%
		(0.91%)		(1.61%)	(2.56%)	(2.34%)	(2.34%)	(1.91)	(0.00%)
	EVA	80.36%	78.93%		78.45%	77.99%	77.99%	77.36%	80.71%
		(0.54%)	(1.03%)		(1.15%)	(1.44%)	(1.44%)	(1.36%)	(0.01%)
	EBIT	80.47%	79.86%	78.45%		77.71%	77.71%	77.29%	80.70%
		(0.65%)	(1.96%)	(1.13%)		(1.16%)	(1.16%)	(1.29%)	(0.00%)
	NI	80.13%	78.89%	77.99%	77.71%		76.55%	76.58%	80.72%
		(0.31%)	(0.99%)	(0.67%)	(0.41%)		(0.00%)	(0.58%)	(0.02%)
	EBEI	80.12%	78.89%	77.99%	77.71%	76.55%		76.58%	80.72%
		(0.30%)	(0.99%)	(0.67%)	(0.41%)	(0.00%)		(0.58%)	(0.02%)
	CVA	79.86%	77.91%	77.36%	77.29%	76.58%	76.58%		80.70%
		(0.04%)	(0.01%)	(0.04%)	(-0.01%)	(0.03%)	(0.03%)		(0.00%)
	NOPAT	82.01%	80.70%	80.71%	80.70%	80.72%	80.72%	80.70%	
		(2.19%)	(2.80%)	(3.39%)	(3.40%)	(4.17%)	(4.17%)	(4.70%)	
p-values	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Note: Estimated R^2 is from the panel data fixed effects model on equation: $\frac{MV_{it}}{tos_{it}} = \alpha_1 + \alpha_2 x_{it}/\ tos_{it} + \alpha_3 y_{it}\ /\ tos_{it} + \varepsilon_{it}$ where MV_{it} is the firm market value of equity three months after the reported date end, x_{it} and y_{it} are any two pairwised performance measures. *Fixed effects p*-values *(F*–statistics) are also reported. The second row represents the adjusted R^2 for the single regression. The numbers in brackets represent the difference between R^2 obtained from the single regression and the R^2 obtained from pairwise regression.NI: net income available to shareholder. EBITDA: earnings before interest, tax, depreciation, and amortization. EBEI: earnings before non-recurring items. CFO: net cash provided by operating activities. EVA: economic value added. CVA: cash value added is calculated as: OCF – OCFD (dividends and interest).

The pairwise combinations of EBITDA and EBIT, EBIT and EVA, and EBITDA and EVA, indicate that adjusted R^2, the explanatory power, has increased by 1.96, 1.13, and 1.03 respectively over EBITDA and EBIT alone. Again the result also indicates that NI has no incremental information content beyond EBEI (0.00 differences). This could be attributed to what we have mentioned earlier which is that the reported NI and EBEI are equal because there are no extraordinary circumstances which exist and even if they did exist it was in small numbers and the descriptive statistics show that NI and EBEI are perfectly correlated. Hence the net operating profit after tax (NOPAT) was introduced to replace the EBEI as a performance measure. Moreover, the result indicates that NI has increased the explanatory power of EVA by some 0.67%. This is inconsistent with Bao and Bao (1998) who claimed that NI has a zero impact on EVA. Overall, the results of Table 4.4.1 indicate that the net operating profit after tax (NOPAT) exhibits the largest incremental information among the performance metrics, with an increase of 2.19 with CFO, 2.80 with EBITDA, 3.39 with EVA, 3.40 with EBIT, 4.17 with both NI and EBEI, and 4.70 with CVA. Contrary to West and Worthington (2000) and according to our results the most logical pairwise combination in explaining market value (stock price) is therefore composed of CVA and NOPAT. However, consistent with Biddle *et al,* (1997) our finding does not support the adage that EVA is the dominant measure and superior to earnings and cash flow measures in its association with the market value and annual stock return (price).

An interesting result is that the CFO has an incremental information content over the rest of the performance measures When paired with EBITDA, EVA, EBIT, NI, EBEI, CVA and NOPAT the adjusted R^2 increased by 2.83, 3.04, 3.17, 3.58, 3.58, 3.86 and 1.31 per cent respectively. This is in contradistinction to Board and Day's (1989) claim (they were the first in the UK to examine the incremental information content of earnings components). They claimed that net income and working capital from operations (WCFO) defined as the net income plus depreciation plus deferred tax separately, hold more information content than net cash (quick) asset (NETQ) that is defined as the net income plus depreciation plus deferred tax plus change in stock and work in progress. In addition their results pointed out that with regard to the incremental information content, net cash flow was the poorest of the measures examined. This might be attributed to the proxies used for the cash flow figure as in that period 1961-1977, the period of their study, the cash flow statement was not mandatory and the companies voluntarily prepared the statement of cash flows. Arnold *et al.* (1991)

reported evidence on the information content for cash flows, which was at odds with the results of prior UK studies. The differences in the results obtained by different studies dealt with the information and incremental information content were due to the differences in the sample and the period of the study. Notwithstanding, with regard to the differences in performance measures and incremental information content, the best combination (but not the most accurate) is when CFO composes NOPAT or EBITDA where the adjusted R^2 is 82.01% or 80.73% in sequences, followed by NOPAT with NI (R^2 = 80.72%) and NOPAT with CVA (R^2 = 80.70%).

4.4.1 The Incremental Information Content of Net Income Components

As discussed in section 3.2.2 hypothesis H_{03} states that net income (NI) components have no statistically significant effect on annual stock price performance. The hypothesis predicts that decomposing net income (NI) into its main components, cash flows and aggregate accruals, is expected to increase the NI (earnings) ability to explain the changes in annual stock performances. The assumption is that each component is expected to reflect different information content (Dechow *et al*, 1998; Barth *et al*, 2001). The aforementioned hypothesis is examined by conducting the following panel regression model under the fixed effects methodologies.

$$\frac{MV_{it}}{tos_{it}} = \alpha_0 + \alpha_1 BV_{it}/\,tos_{it} + \alpha_2 CFO_{it}\,/\,tos_{it} + \alpha_3 \Delta AR_{it}/\,tos_{it} + \alpha_4 \Delta AP_{it}/\,tos_{it} + \alpha_5 \Delta INV_{\,it/\,tos_{it}} + \alpha_6 DEP_{\,it}/\,tos_{it} + \alpha_7 AMORT_{it}/\,tos_{it} + \alpha_8 OTHER_{it}/\,tos_{it} + \varepsilon_{it}$$

where MV_{it} is the firm market value three months after the fiscal year end; CFO is the net cash flow from operating activity, ∆AP is the change in account payables; ∆AR is the change in accounts receivable; ∆INV is the change in inventories, DEP is depreciation, AMORT is amortization, and OTHER is other accruals. The values of both dependent and explanatory variables have been deflated by the outstanding share of each period consistent with Garrod *et al.* (2000).

Table 4.4.1.1 shows some descriptive statistics of NI components. First, CFO has the larger mean among the other explanatory variables (0.29) with a standard deviation (1.41). This value ranges from a minimum of -18.04 to a maximum of 83.76. This is consistent, as expected, with the results obtained by Dechow *et al*. (1998) and Barth *et al*. (2001). Second, while CFO has the larger standard deviation among NI components, change in inventory (ΔINV) has the larger standard deviation among the short term components of accruals (1.12) with a mean value of 0.052. Change in accounts receivable (ΔAR) and change in accounts payables (ΔAP) have mean values of 0.04 and 0.03 respectively with standard deviations of 0.47 and 0.24. The mean value of depreciation (ΔEP), the long term accruals components, is 0.1 with a standard deviation of 0.15. Amortization (AMORT) has a mean value of 0.012 and a 0.04 standard deviation. Finally the other accruals (OTHER) have a least and negative mean of -0.047 with a value range from a minimum of -34.01 to a maximum of 11.00.

Table 4.4.1.1
Descriptive statistics on the Net Income components

	N	Minimum	Maximum	Mean	Std. Deviation
MV	7208	0	94.3	2.755	4.748
BV	7222	0	76.605	1.911	3.861
CFO	5347	-18.042	83.757	0.295	1.442
AMORT	5776	-0.069	0.780	0.012	0.039
ΔAP	5633	-3.587	3.842	0.028	0.244
ΔAR	7222	-14.914	15.102	0.040	0.471
ΔEP	5649	0.000	2.676	0.095	0.153
ΔINV	7222	-64.761	26.732	0.052	1.124
OTHER	7222	-34.013	10.957	-0.047	0.806

Table 4.4.1.2
Pairwise correlation for Net income components

Variables	MV	BV	AMORT	ΔAP	ΔAR	ΔEP	ΔINV	OTHER
MV	1							
BV	.763**	1						
AMORT	.293**	.091**	1					
DAP	.098**	.038**	.000	1				
DAR	.106**	.083**	.005	.263**	1			
DEP	.349**	.289**	.276**	.046**	.075**	1		
DINV	.119**	.090**	-.003	.130**	.190**	.011	1	
OTHER	-.075**	-.065**	-.067**	-.299**	-.485**	-.044**	-.310**	1

Note: The sample has 7,222 firms-year observations. All variables are expressed per outstanding shares. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). where MV_{it} is firm market value three months after the fiscal year end; CFO is the net cash flows from operations, ΔAP is the increase or decrease on accounts payable, ΔAR is the increase or decrease on accounts receivable, ΔINV is the increase or decrease on inventory, DEP is depreciation, AMORT is amortization, and OTHER is other accruals either gains or losses.

Table 4.4.1.2 shows the correlation matrix for the set of NI components. The results indicate that most correlations are positive and significant. However, the other accruals (OTHER) correlations with the remaining components are all negative and significant. The long term accruals components, BV, DEP and AMORT, have the highest correlation with market value (0.763, 0.349 and 0.293 respectively), followed by the change in inventory (0.119) then the change in accounts receivable (0.106) and then change in accounts payables (0.098). Turning to the correlation between other variables, the highest correlation exists between depreciation (DEP) and both book value (BV) and amortisation (AMORT), at 0.289 and 0.276 respectively. Change in accounts receivable (ΔAR) and amortization have the lowest correlation (-0.49%). Table 4.4.1.2 also shows that all the correlation coefficients are less than 0.5.

Turning to the incremental information content of the NI components, Table 4.4.3 shows that all NI components are significant and positively associated with the share price performances at the 0.05 level except for ΔAP, DEP and AMORT which has a significant and negative sign. This is consistent with what Barth *et al*, (2001) reported. They do not predict the sign of other accruals (OTHER) but their result shows a positive and significant association which is consistent with what this study revealed. Furthermore, the results reveal that the NI components have incremental information content. The results show a higher R^2 when decomposing the NI into cash flows and accruals at 82.70% while R^2 is equal to 76.55% when we run the regression against the NI alone. The increase in R^2 by 6.15% indicates that cash flows and accruals components jointly significantly outperform NI in explaining changes in price performances. This is consistent with previous price-based studies. Wilson (1986 and 1987) and Garrod *et al.* (2000) claim that decomposing NI (earnings) into its main components, the cash flows and accruals, will enhance the model's ability to explain the stock performance's volatility.

Prior UK and USA price-based studies that examined the information content of accruals decomposed total accruals into long and short term components, not individual components, which raised difficulties when comparing our results with those which previous studies predicted.

While results in Table 4.4.3 convey that both short-term accruals (e.g. ΔAP, ΔAR, and ΔINV) and long-term accruals (e.g. DEP and AMORT) are relevant as explanatory variables in explaining stock performance, previous studies contradicted each other regarding the value relevance of long and short term accruals. There have been volumes written that attempt to investigate the effects of both long and short term accruals. For instance, Rayburn (1986) and Dechow (1994) claimed that short-term accruals have information content but long term accruals have no information content. Contrary to them, Garrod *et al.* (2000) reported that long term accruals contain information but short term accruals have no information content. Along the same lines, McLeay *et al.* (1997) analysed UK data and reported that the components of accruals, namely the short and long term, have incremental information content beyond that already existing in aggregate earnings.

To conclude, the results in Table 4.4.3 provide empirical evidence on the usefulness of decomposing earnings into operating cash flows and aggregate accruals. They also provide empirical evidence on the usefulness of decomposing aggregate accruals into its main components. Christie (1987) stated that there is no optimal deflator in levels models, but deflation by anything other than a function of independent variable can lead to some specification errors. To this end, all the variables are deflated by the outstanding share at the beginning of each period.

Table (4.4.3)
Test results of the relative information content of Net Income (NI) Components

Regression results using deflated variables	BV +	NI +	CFO +	ΔAP -	ΔAR +	ΔINV +	DEP -	AMORT -	OTHER ±	R^2	F (209.533)
Coefficient estimates	1.12	0.70								76.55%	83.30
Fixed effects *p*-values	0 .0000 ***	0.0000 ***									
Coefficient estimates	0.90		2.2940	-0.6451	1.3820	1.4489	-3.9610	-8.4590	0.7055	82.70%	F (214.331)
p-values	0 .0000 ***		0.0000 ***	0.0000 ***	0 .0000 ***	0.0000 ***	0 .0000 ***	0.0000 ***	0.0000 ***		73.84

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation (Model 3): $\frac{MV_{it}}{tos_{it}} = \alpha_0 + \alpha_1 BV_{it}/\ tos_{it} + \alpha_2 CF_{it}\ /\ tos_{it} + \alpha_3 \Delta AR_{it}/\ tos_{it} + \alpha_4 \Delta AP_{it}/\ tos_{it} + \alpha_5 \Delta INV\ _{it/\ tos_{it}} + \alpha_6 DEP\ _{it}/\ tos_{it} + \alpha_7 AMORT_{it}/\ tos_{it} + \alpha_8 OTHER_{it}/\ tos_{it} + \varepsilon_{it}$ where MV_{it} is firm market value of firm equity three months after the reported date; CFO is the net cash flows from operations activity, ΔAP is the increase and decrease on accounts payable, ΔAR is the increase and decrease on accounts receivable , ΔINV is the increase and decrease on inventories, DEP is depreciation, AMORT is amortization, and OTHER is other accruals. We report the results of the regressions where all variables are deflated by the outstanding number of shares. The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the R^2 *and F- test* respectively.

4.4.2 The Incremental Information Content of EVA components

The incremental information content of the economic value added (EVA) components will be assessed according to the methodology used by West and Worthington (2000) and Bowen *et al,* (1987). We extend this methodology by adopting the valuation part of the Ohlson model and inserting the BV as an explanatory variable. The Stern Stewart accounting adjustments to net operating profit after tax (NOPAT) and the invested capital (IC) are excluded as it was shown in previous studies that they add little to the information content of EVA (Young, 1999). Young (1999, p.9) claimed "…that most of the proposed adjustments have little or no qualitative impact on profits". More importantly, most of these adjustments are costly when applied and undisclosed by Stern Stewart. The incremental information content hypothesis is examined by conducting the following Panel regression model under the fixed effects methodologies.

$$\frac{MV_{it}}{tos_{it}} = \alpha_0 + \alpha_1 BV_{it}/\, tos_{it} + \alpha_2 CFO_{it}\,/\, tos_{it} + \alpha_3 ACCR_{it}/\, tos_{it} + \alpha_4 ATINT_{it}/\, tos_{it} + \alpha_5 CAPCHG_{\ it}/\, tos_{it} + \varepsilon_{it}$$

MV_{it} is the firm market value three months after the fiscal year end *t* for firm *i*; BV is the book value, CFO is the net cash flow from operating activity, ACCR is defined as NI– (OCF+ΔAR+ΔINV-ΔAP-DEP), ATINT is after tax interest and CAPCHG is the capital charge. We report the results of the regressions where all variables are deflated by the outstanding number of shares (*tos*).

The descriptive statistics for EVA's components are presented in Panel A of Table 4.4.4. Consistent with Ismail (2006) ATINT has the lowest mean and standard deviation among the components, whereas BV, CFO and ACCR have the highest standard deviation, at 3.86, 1.44 and 1.19 respectively. The means of the variables used in the estimation model are positive except that ACCR is negative (ACCR= NI – CFO). The negative sign of the ACCR mean is attributed to the fact that accruals include the non-cash items, depreciation and amortization, and this is consistent with what Sloan (1993) and West and Worthington (2000) had claimed.

Table (4.4.4)

***Panel A*: Descriptive statistics on the Economic value added (EVA) components**

	N	Minimum	Maximum	Mean	Std. Deviation
BV	7222	.00005	76.605	1.911	3.861
CFO	5347	-18.042	83.757	0.297	1.442
ACCR	7222	-68.280	23.343	-0.039	1.197
ATINT	7222	-2.296	4.494	0.050	0.136
CAPCHG	7222	-9.125	24.866	0.214	0.760

***Panel B*: Pair-wise correlation for Economic value added (EVA) components**

	MV	BV	CFO	ACCR	ATINT	CAPCHG
MV	1					
BV	.763**	1				
CFO	.201**	.222**	1			
ACCR	.052**	.038**	-.865**	1		
ATINT	.435**	.571**	.157**	-.018	1	
CAPCHG	.340**	.423**	.193**	.037**	.370**	1

Note: The sample has 7,222 firms-year observations. All variables are expressed per outstanding shares. **. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). The variables are defined as: MV_{it} is firm market value three months after the reporting date; CFO is the net cash flow from operating activity, ACCR is accruals, ATINT is after tax interest , and CAPCHG is the capital charge.

Panel B of Table 4.4.4, consistent with Biddle *et al,* (1997), reveals that CFO has a negative significant correlation with ACCR. The correlations between CFO, ATINT and CAPCHG are significant and positive, while our results report that the correlation between ACCR and ATINT is negative and insignificant. Further, the negative correlation between CFO and ACCR is consistent with the fact that "accrual process smoothing earnings relative to the underlying operating cash flows" (Biddle *et al,* 1997, p.316).

However, for the purposes of the current research, the accounting adjustments (ACCTADJ) first introduced by Stern and Stewart (1991) were excluded from EVA's components. This exclusion was as a result of the fact that from the beginning I have treated the EVA as it is mentioned in the economic theory, that is, similar in its essence to the residual income (RI) concept mentioned in the literature centuries ago (Drucker, 1995). Another important reason is that many researchers treat these adjustments as cosmetic and adding little information content to EVA (Young, 1999). Finally, few UK companies announced the adoption of EVA and the adoption period was brief. Hence, EVA is defined as:

$$EVA = CFO + Accruals + ATInt - BV_{t-1} \times WACC$$

Table 4.4.5 provides results of the incremental information of the EVA components from.

$$MV_{it} \,/\, tos_{it} = \alpha_0 + \alpha_1 BV_{it} / \, tos_{it} + \ \alpha_2 CFO_{it} \,/\, tos_{it} + \alpha_3 ACCR_{it} / \\ tos_{it} + \alpha_4 ATINT_{it} / \, tos_{it} + \alpha_5 CAPCHG_{\ it / \, tos_{it}} + \varepsilon_{it} \,.$$

In this regression all the coefficients are significant at the 0.01 level of significance and different from zero. The sign of the association (provided below the variables) is in line with the literature except for ATINT which has an opposite sign.

The results show higher R^2 when decomposing the EVA into its main components (80.23%) while R^2 is equal to 77.32% when we run the regression against the EVA alone. The increase in R^2 by 2.91% indicates that EVA components together significantly outperform EVA in explaining changes in price performances. This is consistent with previous price-based studies (Biddle *et al*, 1997; West and Worthington, 2000). Biddle *et al.,* claim that decomposing EVA into its main components will enhance some of the model's ability to explain the stock performance's volatility.

Again, consistent with West and Worthington (2000) CFO and ATINT have the highest positive coefficient among EVA components.

Table 4.4.6 provides the results of the pairwise regressions of the EVA components. All the components are significant at conventional levels. The results indicate that in each pairwise comparison, each component of EVA has an incremental information content beyond that which already exists in other components. Based on the partial *F*-test all pairwise between any two components are significantly different from one another and this is consistent with the results revealed by Biddle *et al.,* (1995), Biddle *et al.,* (1997) and Ismail, (2006). Moreover, the best pair of components is the one between the ACCR, a component on NOPAT, and the CAPCHG (calculated as invested capital (IC) × WACC), an EVA component, followed by ACCR and ATINT (calculated as Interest expense (1- Tax rate)) where the pairwise partial *F*-tests are 81.81 and 81.79 respectively. While CFO and ATINT have the highest coefficient estimates among the other components (1.81, 1.90 respectively) when paired they had a low partial *F*-test (66.31).

The results also indicate that the EVA main components (e.g. CAPCHG and ATINT) have added some information content when they were paired with other EVA components. However, this contribution does not reach the level that makes EVA the dominant performance measure. As seen in section 4.3, EVA has been positioned as the third performance measure in its association with stock performances. The negative association between CAPCHG, which is equal to (capital employed[26] × WACC), and market value corresponds with the literature and may be attributed to the size effect theory where large firms earn low returns (Banz, 1981).

[26] Capital employed refers to total equity plus non-current liabilities.

Table (4.4.5)
Test results of the relative information content of Economic value added (EVA) Components

Regression results using deflated variables	BV	EVA	CFO +	ACCR +	ATINT -	CAPCHG -	*Adjusted-* R^2	F (209.533)
Coefficient estimates	1.18	0.81					77.32%	82.03
Fixed effects *p*-values	0 .0000 ***	0.0000 ***						
Coefficient estimates	1.046		1.805	0.6138	1.9036	-0.0679	80.23%	F (212.352)
p-values	0 .0000 ***		0.0000 ***	0.0000 ***	0 .0004 ***	0.0094 ***		67.30

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using the two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation (Model 3): $\frac{MV_{it}}{tos_{it}} = \alpha_0 + \alpha_1 BV_{it}/\ tos_{it} + \ \alpha_2 CFO_{it}\ /\ tos_{it} + \alpha_3 ACCR_{it}/\ tos_{it} + \alpha_4 ATINT_{it}/\ tos_{it} + \alpha_5 CAPCHG\ _{it/\ tos_{it}} + \varepsilon_{it}$. where MV_{it} is market value of firm equity three months after the reporting date; α_0 is the intercept, CFO is the net cash flows from operations activity, ACCR is accruals, ATINT is after tax interest , and CAPCHG is the capital charge. We report the results of the regressions where all variables are deflated by the outstanding number of shares. The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the *R^2 and F- test* respectively.

Table 4.4.6 Tests of incremental information content of EVA

Variables	Coefficient estimates	Pairwise partial *F- test*		
BV	1.05			
CFO	1.81			
		67.60***		
ACCR	0.61		66.31***	
		81.79***		66.28***
ATINT	1.9		81.81***	
		80.17***		
CAPCHG	-0.07			
Adjusted R²	*80.23%			
p-values based *F-test*		0.0000	0.0000	0.0000

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using the two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation: $MV_{it} / tos_{it} = \alpha_0 + \alpha_1 x_{it} / tos_{it} + \alpha_2 y_{it} / tos_{it} + \varepsilon_{it}$ where MV_{it} is the market value of firm equity three months after the reporting date, α_0 is the intercept, x_{it} and y_{it} are any two pairwised variables (e.g. CFO, ACCR, ATINT, and CAPCHG). Pairwise partial *F*–statistics are also reported. In the first column the tests are performed between the first and second, the second and third and third and fourth coefficients. The second column contains tests between the first and the third and the second and the fourth coefficients. The last column contains tests between the first and the fourth coefficients. We report the results of the regressions where all variables are deflated by the outstanding number of shares. The last row shows the two-tailed p-values of the non-directional *F*-test.

Finally, Table 4.4.7 shows some statistics that associated with the comparison of the Adjusted R^2 of the pairwised regression of the components of EVA. The results show that CAPCHG and ATINT are insignificant when paired with CFO and ACCR. Notwithstanding this result, all of the EVA components are significant and contained information beyond each other.

Table 4.4.7
The Incremental Information Content of Economic value added (EVA) components

Panel: R regression results using deflated variables		ATINT/CHAPCHG	ACC/CHAPCHG	CFO/ATINT
Adjusted R² Single regression	pairwise regression	75.60%	75.70%	78.73%
78.70%	CFO			0.174
75.70%	ACCR		0.000	
75.60%	CHAPCHG	0.469	0.424	
75.60%	ATINT	0.142		0.000

Note: Estimated R^2 are from the panel data fixed effects model in equation: $\frac{MV_{it}}{tos_{it}} = \alpha_0 + \alpha_1 x_{it} / \, tos_{it} + \alpha_2 y_{it} \, / \, tos_{it} + \varepsilon_{it}$ where MV_{it} is the market value of firm equity three months after the reporting date, x_{it} and y_{it} are any two pair wised performance measures. *p*-values) are also reported for each component when they are paired. CFO is net operating cash flow, ACCR is accruals, CHAPCHG is capital charges and ATINT is after tax interest.

Board and Day's (1989) study is considered the first in the UK to examine the incremental information content of earnings' components. Board and Day compared the respective abilities of net income, working capital from operations and net cash flows to explain the variations in stock return over the period 1961-1977. They declared that net income and working capital from operations separately hold more information content than net cash flows. They also extended their investigation to the incremental information content for these variables. The results regarding the incremental information content, pointed out that the net cash flow was the poorest of the measures examined.

4.5 Empirical Results of the Return Model

Most of the past extant literature (e.g. Board and Day, 1989; Biddle *et al*. 1995, 1997; Bao and Bao, 1998; West and Worthington, 2000; Ismail, 2006) adopted the return model, the valuation component of the Ohlson model, to examine the value relevance and incremental information content of a set of different accounting measures and also test the association between these measures and the variation in annual stock. One common feature of the aforementioned papers is that the ordinary least square (OLS) regression was the technique applied for the set of cross-sectional and time series data to obtain the results. This is the procedure that was sharply criticised by econometricians because it might lead to biased and inaccurate estimates of the coefficients. Along the same lines, Gujarati (2003) suggests applying panel data regression which takes into consideration the specific characteristic of each cross-section as opposed to the OLS regression.

We extend the previous work by introducing the book value (BV) in the valuation model and treating it as an independent variable to be combined with the other performance measures in a multivariate regression. Ohlson (1995) defines the stock price as the combination of current BV, current abnormal earnings and other value relevant information. Furthermore, we adopt the fixed effects model and allow the intercept to vary across individuals but not across the time dimension. Finally, in terms of comparison, we will report the results obtained from adopting both the traditional valuation method and the one introduced by Ohlson (1995).

The results in Table 4.5.1 show the value relevance of the investigated performance measures using the same model adopted by Biddle *et al.* (1997) and West and Worthington (2000). The analysis shows that all the performance metrics are significant and positively associated with the compound share return at the 0.05 level except for the CVA which has a significant and negative sign. Moreover, the explanatory power for all variables is significantly higher than that found in the study by Biddle *et al.*, (1997).

The negative sign of the CVA is consistent with the profitability concept where companies in the long run are less capable of generating high profits and accept the level of return that is sufficient to cover its cost of capital which means firms will enter into the value destroying phase rather than generating value. The explanatory power of EBITDA is 15.13% higher than NI and both EVA and CVA. This is against the unwritten rule that EVA has the ability to overshadow other performance measures. Regardless of the low Adjusted R^2 of accounting–based measures, reported by Biddle *et al*, (1997), our result is consistent with the claim that traditional performance measures (i.e. EBITDA, EBIT, EBEI) have more information content than that of value added measures (i.e. EVA and CVA). Moreover, NI stands on the fourth position after EBITDA, EBIT and EBEI respectively. In terms of a comparison of our results this is highly consistent with West and Worthington (2000) who estimated the value relevance of EBEI, RI, NCF and EVA at 23.7%, 19.3%, 18.1% and 14.29% respectively.

Table 4.5.2 presents results obtained after extending the Biddle model to include the security book value BV into the valuation model, that is:

$$R_{it} = \beta_0 + \beta_1 \frac{Bv_{it}}{MV_{it}} + \beta_2 \frac{X_{it}}{MV_{it}} + \varepsilon_{it}$$

The inclusion of the book value of equity controls for possible size effect. It is well-known that small firms earn abnormally larger returns even after controlling for risk. Therefore, attempting to explain returns by a single performance measure might suffer from an omitted variable bias. The omitted variables may vary, but it is believe that size is a good proxy for other factors that might influence the firm's return.

Table 4.5.1
Test results of the relative information content of independent variables using the Return Model and panel data fixed effects model (Time Effects). Variables are used in levels

Regression results using Return Model	NI	EBITDA	EBIT	EBEI	CFO	CVA	EVA	R^2	F
Coefficient estimates	0.152***							14.70%	37.96
		0.103***						15.13%	39.00
			0.121***					15.11%	39.02
				0.152***				14.73%	38.10
					0.106***			13.80%	39.04
						-0.0002***		12.35%	31.25
							0.042***	12.87%	32.79
p-values	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using the two-tailed test. Estimated coefficients are from the panel data fixed effects model in equation (1) $R_{it} = \beta_0 + \beta_1 X_{it}\ MV_{it}/+ \varepsilon_{it}$ where R_{it} is compound annual market return value three months after the reporting date; β_0 intercept; X_{it} is a performance measure (e.g. NI, EBITDA, EBIT, EBEI, CFO, CVA, EVA). We report the results of the regressions where the independent variables are deflated by market value at *t-1*. The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the *R^2 and F- test* respectively.

Table 4.5.2
Test results of the relative information content of independent variables using Return Model and panel data fixed effects model (Time Effects). Variables are used in levels

Regression results using Return Model	BV	NI	EBITDA	EBIT	EBEI	CFO	CVA	EVA	R^2	F (32.68)
Coefficient estimates	0.002 (0.134)	0.147***							14.71%	36.84
	-0.002 (0.432)		0.106***						15.14%	37.79
	-0.0001 (0.937)			0.121***					15.11%	37.79
	0.002 (0.141)				0.146***				14.76%	36.68
	0.003 (0.153)					0.102***			13.81%	37.36
	0.009 (0.000)***						-0.0002		12.72%	31.15
	0.016 (0.000)***							0.065***	13.89%	34.47
p-values		0.0000	0.0000	0.0000	0.0000	0.0000	0.113	0.0000		

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using the two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation (1) $R_{it} = \beta_0 + \beta_1 Bv_{it} + \beta_2 X_{it} / MV_{it} + \varepsilon_{it}$ where R_{it} is the compound annual market return value three months after the reporting date; β_0 intercept; X_{it} is a performance measure (e.g. NI, EBITDA, EBIT, EBEI, CFO, CVA, EVA). We report the results of the regressions where independent variables are deflated by the market value at *t-1*. The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the *R² and F- test* respectively. Numbers between brackets are p-values.

Two observations from Table 4.5.2 are of special interest. First, by comparing the results presented in Table 4.5.1 with 4.5.2, particularly the adjusted-R^2, we discover that the inclusion of BV into the valuation model has a significant effect with the adjusted-R^2 barely changing. We also note that EVA has the highest increase in explanatory power- adjusted-R^2 increased by 1.02 % for EVA (Table 4.5.2). We also notice that all the variables, except for CVA, are significant at conventional levels. The second observation we can make is that BV appears insignificant in all combinations except when paired with the cash value added measures (CVA and EVA). This might be attributed to the inherent characteristics of accrual that BV might contain important information about stock returns and performances that already exist in other measures (e.g. NI, EBITDA, EBIT, EBEI and CFO). The abovementioned results describe how the explanatory variables behave in levels. Tables 4.5.3 show how the same variables behave in changes in levels.

Looking at the results in Table 5.4.3 and 5.4.4 using the changes in variables, it can be noticed that all of the explanatory variables are significant. For all variables the Adjusted R^2 is slightly low. Again EVA and CVA, the value added measures, were still dominated by the traditional and cash flow metrics. NI still has a higher explanatory power than EVA. Consequently, despite the valuation model we use- the price or return model- the claim that EVA is dominant among the performance measures is refuted.

The same results are obtained when applying the return model and including the BV value as a dependent variable. ΔEBEI have the highest explanatory power ($R^2 = 14.76\%$) followed by ΔEBITDA and ΔEBIT where R^2 is 13.61% and 13.57% respectively. CVA has the lowest adjusted R^2 (12.76%) and is negatively associated with the stock return.

Table 4.5.3
Test results of the relative information content of independent variables using Return Model and panel data fixed effects model (Time Effects). Variables are used in changes

Regression results using Return Model	ΔNI		ΔEBITDA		ΔEBIT		ΔEBEI		ΔCFO		ΔCVA		ΔEVA		R^2	F (30.65)
Coefficient estimates	0.075	***													13.30%	33.32
			0.060	***											13.61%	33.82
					0.069	***									13.57%	33.84
							0.076	***							13.37%	32.74
									0.039	***					12.87%	35.45
											-0.0006	***			12.62%	32.12
													0.020	***	12.69%	32.31
p-values	0.0000		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000			

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using the two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation (1) R_{it} =β_0 + β $_1X_{it}$ /MV_{it}+ ε_{it} where R_{it} is the compound annual market return value three months after the reporting date end; β_0 intercept; X_{it} is a performance measure (e.g. NI, EBITDA, EBIT, EBEI, CFO, CVA, EVA). We report the results of the regressions where independent variables are deflated by the market value of equity at the beginning of the period MV_{it-1} . The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the *R^2 and F- test* respectively.

Table 4.5.4
Test results of the relative information content of independent variables and BV using Return Model and panel data fixed effects model (Time Effects). Variables are used in changes

Regression results using Return Model	**ΔBV**	**ΔNI**	**ΔEBITDA**	**ΔEBIT**	**ΔEBEI**	**ΔCFO**	**ΔCVA**	**ΔEVA**	***R^2***	**F (21.48)**
Coefficient estimates	0.002 (0.376)	0.072***							13.32%	32.28
	-0.002 (0.469)		0.063***						13.61%	32.75
	-0.0003 (0.937)			0.069***					13.57%	32.74
	0.002 (0.391)				0.073***				14.76%	32.44
	0.003 (0.248)					0.035***			12.89%	33.82
	0.007 (0.001)***						-0.0005***		12.76%	30.73
	0.011 (0.000)***							0.026***	12.94%	31.22
p-values		0.000	0.000	0.000	0.000	0.000	0.003	0.000		

Note: ***, **,* Significantly different from zero at the 1, 5 and 10 per cent levels, respectively, using the two-tailed test. Estimated coefficients are from the panel data fixed effects model on equation (1) $R_{it} = \beta_0 + \beta_1 Bv_{it} + \beta_2 (X_{it} - X_{it-1})/ MV_{it-1} + \varepsilon_{it}$ where R_{it} is the compound annual market return value three months after the reporting date, β_0 intercept, X_{it} is a performance measure (e.g. NI, EBITDA, EBIT, EBEI, CFO, CVA, EVA). Independent variables are deflated by the market value at the beginning of each period. The last row shows the two-tailed p-values of the fixed effects model. The last two columns show the *R^2 and F- test* respectively.

4.6 Conclusion

In this chapter I have examined the associations between the traditional, cash flow and value added performance measures and the changes in share price and return performances during the period 1960 to 2012. The performance measures examined are: NI, EBITDA, EBIT, EBEI, CFO, EVA and CVA. I extended the work of Biddle *et al.* (1997) and West and Worthington (2000) through the incorporation of the book value (BV), as a major explanatory variable with other performance measures into the price and return valuation model as a determinant of the share price (Ohlson, 1995). The BV component had been excluded by different scholars while adopting the traditional price and return valuation models.

The main performance measures, i.e. The net income (NI) and the economic value added (EVA), are the most vulnerable to attack and debate from researchers. I decomposed them into their major components to examine whether these components contain more information than the original measure. Moreover, the accounting adjustment that Stern & Stewart suggested to the net operating profit after tax (NOPAT) and the invested capital (IC) were excluded from EVA's components as, first, the adoption of EVA as a compensation and management tool was limited to five companies in the UK. Second, as claimed by Young (1999) this accounting adjustment added little to the EVA information content. Finally, these adjustments are obviously undisclosed by Stern and Stewart (1991).

As the obtained results, (in regard to the superiority of any of these performance measures from previous US and UK studies) were mixed and as these differences were attributed to the different methodologies adopted by different researchers, the way they select the variables and the proxies they used for different accounting numbers. The current research attempts to overcome these contradictions within the results obtained by adopting the same methodology over the period of investigation (1960-2012) and to using the same definition and calculation of the variables used to conduct this research. Further, the variables were used in level and change forms.

The results obtained in this chapter show that when applying the price model, the CFO has the highest explanatory power among the other variables and outperforms both the NI and the EVA which were the measures that were the focus of attention for long periods of time. Interestingly, the adjusted- R^2 increased rapidly after the incorporation into the price model of BV as an explanatory variable. In addition the results show that EBITDA is the dominant among variables when we used the return model following earnings before interest and tax (EBIT) but the adjusted- $R^2$is quite low compared to that which I obtained from the price model.

With regard to the incremental information content, the result indicates that there is significant incremental information content existing between pairwise measures. The NI still has the ability to outperform EVA as its explanatory power increases by 0.67% when paired with NI. The highest adjusted- R^2 is obtained when CFO is paired with NOPAT (R^2=82.01%) and the lowest exists when NI is paired with EBEI (R^2=76.55%). The results also provide empirical evidence on the incremental information content of EVA and NI components with regard to explaining the variation in stock performances. The adjusted- R^2 increased by 2.91% after the decomposition which indicates that EVA's components together significantly outperform EVA in explaining changes in price performances. The best results are achieved when accruals (ACCR) are separately paired with the capital charge (CAPCHG) and after tax interest (ATINT). Interestingly, the traditional performance measures still have the ability to compete and outperform the value added measures.

One interesting result is that when I regressed the extended version of the Biddle *et al.* model the results obtained which were in favour of the adjusted-R^2 were similar to the results obtained when applying the return model and excluding the book value (BV) as a dependent variable. This might indicate that unlike the price model, the book value (BV) adds little to other variables' information content. The changes in earnings before extraordinary items (EBIT) have the highest adjusted- R^2(14.76%) when adopting the extend version of Biddle *et al*, and earnings before interest depreciation and amortization (EBITDA) had the highest adjusted-R^2 (13.37%) when adopting the normal return model.

In conclusion, while much of the debate regards accurate and best performance measures, it must not be forgotten that determining which of the performance measures is the best is a murky matter.

Chapter 5

The Impact of Economic Value Added (EVA) Adoption On Stock Performance

5.1 Introduction

It is generally accepted that the role of the executive manager is to maximize the firm's value (Wallace, 1997; Malmi and Ikaheimo, 2003). The shareholders of a business enterprise are better off when its management chooses investment decisions that lead to maximizing their wealth. Therefore, evaluating a manager's performance on the basis of whether it increases the stakeholder's wealth is a proper approach. To this end, many performance metrics have been advocated by researchers that examine how well a firm, and particularly the executive manager of that firm, performs. These methods include: (i) traditional methods such as accounting earnings or operating profit; (ii) profitability measures such as return on asset (ROA) or return on investment (ROI); (iii) cash flow measures; and (iv) value-based performance measures such as residual income (RI) method and particularly economic value added (EVA) and cash value added (CVA).

Currently the advocated performance tools are the value-based management (VBM) that takes into consideration the cost of invested capital (debt and equity) when calculating the increase in wealth a firm generates as a result of this investment, such as the residual income method (RI). One question that needs to be asked is why this issue has received such attention? According to Drucker (1995, p.59) "until a business returns a profit that is greater than its cost of capital, it does not create wealth; it destroys it." The most commonly used residual income performance measurement metrics are the economic value added (EVA) first introduced by Stern & Stewart Co. in 1991, and the cash value added (CVA) model by the Boston Consulting Group (Malmi and Ikaheimo, 2003).

The vast majority of research has examined whether the adoption of EVA's incentive compensation plan has any impact on managers' investment behaviour (Wallace, 1997; Kleiman, 1999; Hogan and Lewis, 2005). All of this empirical research has the common assumption that the adoption of the EVA compensation system will rationalize a firm's investment decision and will lead to using the existing assets more efficiently to generate more residual income and, hence, to maximize shareholders' wealth as well.

The purpose of this chapter is to examine whether the adoption of the EVA framework enhances the firm's performance and to gauge the long-term effects of such an adoption on the firm's profitability. It also assesses whether the market reacts to the announcement of the adoption of EVA as a compensation system. The event study methodology initially introduced by Fama *et al.* (1969) will be used to assess the impact of EVA's adoption on a firm's performance.

In a corporate context, the usefulness of event studies arises from the fact that the magnitude of abnormal performance at the time of an event provides a measure of the (unanticipated) impact of this type of event on the wealth of the firms' shareholders. Event studies start with a hypothesis on how a particular event is expected to affect the value of a firm. The hypothesis that the value of the company has increased (decreased) will be reflected in the stock showing an abnormal return. Coupled with the notion that the information is readily contained in prices, the concept of abnormal returns (or performance) is the key point of event study methods.

The efficient market hypothesis (EMH) states that stock prices fully reflect all publicly available information and no information or analysis can provide investors with the opportunity to outperform the market. As a result any news announcement concerning a company is rapidly subsumed within its stock price and announcements will on average not affect stock prices beyond a very short period of time. Departing from EMH, when these announcements take place there might sometimes be an abnormal reaction in the share prices of the underlying stocks. Such reactions can be measured using the event study approach where the movement in stock prices around the event dates is analysed to determine if the event in question has had an effect on the value of the underlying stocks or not.

The most common approach of the event study involves three steps: (1) The computation of the parameters in the estimation period; (2) The computing of the forecast errors (and obtaining variance/covariance information) for a period, or over an event window; aggregate across firms and infer the average effect; (3) Use the abnormal returns in a cross –sectional regression against the relevant features of the stock which is supposed to influence the impact of the event.

The use of the traded market EVA performance measure has grown rapidly since the 1990s in the USA and across different European countries. In the UK there are four companies that reported the EVA as a performance and management tool. These companies are Tate & Lyle, GSK, Hanson (now Heidelberg) and Diageo. While EVA was implemented in the late 1990s and early 2000s, some companies may no longer be using it.[27] As a result the focus will be on the USA companies that have adopted EVA as a management tool and as a compensation system.

The structure of this chapter is organized in the following way. Section 5.2 will discuss the main results of the previous studies that have investigated the impact of EVA adoption on a firm's performance. Section 5.3 describes the sample and section 5.4 the methodology used. Section 5.5 discusses the empirical results obtained and finally section 5.6 summarises the main conclusions.

5.2 Previous studies

There is an underlying assumption that firms adopting the residual income method have the ability to enhance their profitability and maximize shareholder's wealth. This can be achieved by increasing a firm's ability to generate a large residual income and encourage managers to invest in those projects that can earn more than the cost of the capital invested. Furthermore, EVA's proponents claim that the adoption of the EVA framework will affect the manager's behaviour and lead to the best alignment of management interests with those of the shareholders (Stewart, 1991; Wallace, 1997). To address this growing issue, several empirical studies were conducted to explore whether the adoption of residual income-based performance incentives, namely the adoption of the EVA framework, will lead to any differences in firms' investment patterns (Wallace 1997: Kleiman, 1999; Sharma and Kumar, 2010). However, the results have been mixed.

Wallace's (1997) study is a seminal contribution that addressed the changes in profitability that a firm achieves when adopting EVA. Wallace's methodology has been replicated by a number of scholars such as Kleiman (1999), Hogan and Lewis (2005) and Balachandran (2006). Wallace (1997) compared a group of forty companies adopting residual income (RI) as a compensation plan with the same number of control firms to examine whether the adoption of RI, the investing decision, finance decision, operating decision and shareholder wealth would increase or decrease within three post

[27] Source: Stern Stewart Ltd. London Branch dated March 15, 2012.

adoption periods. Wallace's methodology has been discussed in detail in chapter 6 of the current study.

In a closely related study, Kleiman (1999) extended Wallace's methodology by using a sample of 71 firms adopting EVA as an incentive compensation system. Based on US data for the period 1987-96, he examined the impacts of the adoption of EVA on shareholders' value. He also replicated the same method used by Wallace (1997) to estimate the 'closest-matched peer firm' (the control firms). Unlike Wallace, the focus was limited to those firms that adopted the EVA compensation plan rather than the RI-based compensation plan and on the consequences of the EVA adoption on shareholders' value rather than on the improvement of firms' operating performances.

The findings of Kleiman (1999) were that all the EVA adopters show a significant and higher stock performance (return) than their competitors, the peer companies, while before the adoption date they were equivalent with regard to their stock performances.

Turning to operating performance analysis, the findings of Kleiman contend that firms were monitoring their working capital regardless of the incentive compensation plan they adopted. Moreover, his results do not show any capital expenditure decline, the manager's behaviour has no obvious bias against new investment which is a finding inconsistent with that of Wallace (1997). Further, consistent with theoretical arguments and as Wallace (1997) reported, EVA-adopting companies significantly increase their financial leverage. This increase is mostly achieved through extended share repurchases. Finally, the results show substantial enhancement in both operating margins and operating profits before depreciation.

Responding to the criticism that was raised against Wallace's (1997) work, Hogan and Lewis (2005) used a sample of 108 firms that chose to adopt the economic profit plans (EPPs) as incentive compensation systems between 1983 and 1996 to examine whether the adoption would affect these firms' operating, organizational, financial and compensation characteristics. Unlike Wallace and probably to account for the pre-adoption performances they estimate a logistic regression model to select the optimal control-matched firms. Accordingly, their control firms' sample fall into four categories: anticipated adopters, surprise adopters, anticipated non-adopters, and surprise non-adopters. They then compare the performances of these categories to assess whether adopting firms will outperform firms that are predicted to adopt EPPs but do not. The focus of their research has been on analysing whether the adoption firms will achieve the same increases in their performance if they chose to continue using traditional performance-based compensation plans. Furthermore, they replicate the same method used by Wallace (1997).

The findings of Hogan and Lewis (2005) reveal that all EPP adopter firms show a significant enhancement in operating performance relative to their past performance (pre-adoption period). In addition they show a significant difference in investment behaviour, operating performance and value creation. This result is consistent with the notion that an EPP-based compensation system encourages managers to choose profitable projects that ultimately maximize shareholders' wealth. Turning to the control-matched firms' categories and the comparison of the performance of anticipated adopter firms to that of surprise non-adopters the findings of Hogan and Lewis reveal that adopter firms used the operating asset more efficiently, improved their operating performance, and maximized outstanding shareholder wealth. This is consistent with Wallace's findings (1997). However, their results fail to show a significant improvement when compared with anticipated non-adopters and surprise adopter firms.

Similarly, Balachandran (2006) investigated whether switching from tradition accounting-based performance plans, specifically earnings and returns on investment-based compensation plans, to an EVA- based compensation incentive will affect the investment motif. He used a sample of 181 firms that adopted the residual income (RI)-based compensation incentive. These firms fell into two main categories: those which previously adopted earnings as a compensation plan and then shifted to RI-based compensation plan and those that adopted ROI-based compensation plan.

The criterion that Balachandran used to judge whether there is any difference in investment patterns is the firm's ability to generate more residual income after the adoption (the delivered RI is likely to improve). Furthermore, he applied three specifications to conduct his test. In the first and second specifications the firm used its own controls but the control variables are different for each specification (Balachandran, 2006. p.390). Finally, he used both the adopted firm and the matched firm as a control variable.

Balachandran concludes that the results regarding the control variable used are mixed. For the first specification the results show a significant difference in the investment pattern when the firm switched from an earning-based compensation plan to an RI-based compensation incentive; the second specification shows the same significant difference for firms which switched from an ROI- based compensation plan while the third specification shows no significant difference in investment pattern. Turning to the delivered RI, the results show that the generated RI is increased when firms adopted the RI-based compensation plan. Finally, his conclusion is consistent with Wallace's (1997) notion that "you get what you pay for".

However, in Wallace's and Balachandran's (2006) analyses of the firms that adopted the residual income-based compensation plan, they did not indicate whether these firms specifically adopted the EVA framework. Thus, the findings of their research will not only attribute to EVA a compensation technique but this advantage should be traced to all residual income (RI) methods. Kleiman (1999) limited his sample to those firms that adopted the EVA framework and discussed the impact of EVA's adoption on the firm's ability to maximize shareholder value. This will more effectively indicate whether the enhancement the companies have achieved regarding stock price performance could be attributed directly to its ability to generate more operating income after adoption rather than to the existing economic circumstances in the market where all these firms operate. Hopefully, Kleiman's finding will respond well to the question that has received much attention in the literature: could "EVA and residual income prove effective in motivating managers for shareholder wealth creation" (Sharma and Kumar, p. 205).

In a similar work, Lovata and Costigan (2002) used a sample of 115 US firms to examine the characteristics of firms that have integrated EVA into an incentive compensation system. The theory's assumption is that the adoption of the EVA framework will better align the managers' interests with those of the shareholders which would mitigate the moral hazard issue. Their claim was that firms which experience high agency conflicts are more likely to adopt the EVA-based compensation plan.

Lovata and Costigan make a comparison between companies adopting EVA and companies that have not in order to investigate whether the adoption of an EVA compensation plan will alleviate the agency conflicts. They used the agency theory variables such as the firm coefficient of risk Beta, institutional ownership, insider ownership, and R&D/Sales ratio to test the implication of adopting EVA for organizational behaviour and characteristics.

The results of Lovata and Costigan show that the EVA compensation system is suitable for the companies that have the following characteristics: (i) less insider ownership, (ii) high proportion of institutional investors, and (iii) companies that maintain a lower R&D/Sales ratio. However firms where their current earnings have less power to predict future success tend to use performance measures rather than the EVA metric.

Additionally, as the abovementioned studies point out, the EVA technique may be used for two purposes. It is adopted as a decision making tool and used as a compensation incentive plan. In the literature, firms usually first adopt the EVA framework as a management tool and then introduce it as their incentive compensation scheme (Ittner and Larcker, 1998) However, they claim that the majority of firms introduce the EVA framework for decision making, rather than as an incentive compensation plan.

Previous tests have encountered several difficulties in addressing this argument. The reason is simple: you cannot formally test different and unrelated samples. Our data on the other hand enable testing across all available news types because they are from the same sample. The sample selection processes will be explained in detail in section 5.3 below.

5.3 Sample

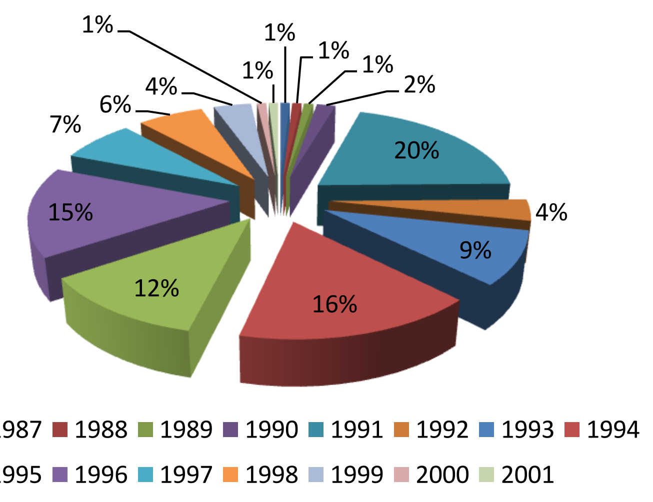
This chapter aimed to examine the consequences of adopting the EVA compensation incentives plan. The sample comprises US firms that have chosen to adopt the EVA compensation system. Consistent with Wallace, 1997 and Kleiman (1999) the first year of the company announcing its adoption of EVA is defined as the event year, and for the purpose of the current research we consider the month of December of that year as an event date ($t = 0$). Initially, we start with Wallace's 23 firms that adopted the EVA compensation plan. This list of adopter firms was then updated by Kleiman and the number of EVA adopters was increased to 71 firms. Then, we began our search using various databases where the EVA-implementing firms may be identified. These comprise the Stern Stewart & Co. brochure, Lexis-Nexis, Proxy Statement, 10-Q report and Wall Street Journal. The majority of firms which adopted EVA have disclosed such information in their official release. For example, RR Donnelley & Sons Co. states in its 10-Q report:

"Over the past three years, **the company has adopted the principles of Economic Value Added (EVA) as its primary financial framework.** The objective of this system is to put in place a system of value-based metrics that measures periodic progress toward improved shareholder value creation. To enhance value, the company moved to improve its manufacturing efficiencies in 1996 by initiating the restructuring of its U.S. gravure printing platform; closing of its commercial print operations in the United Kingdom; and integrating its Digital Division assets into other operations. These actions should generate sustainable cost savings in the long run. During 1997, as the restructuring continues, operating efficiency will decline temporarily due to the movement of equipment, retraining of people and movement of printing among facilities.

Over time, **the application of the EVA financial framework to the company's decision-making process is likely to produce slower revenue growth, enhanced free cash flow, a stronger competitive position and improved return on invested capital**"[28].

I identified an initial list of 101 firms adopting EVA in the period 1987- 2001; these represent different US market sectors. A total of 12 EVA adopters were then excluded from the sample because of the unavailability of price/return information and accounting data, leaving a final sample of 89 EVA adopters on NASDAQ, NYSE and American Stock Exchange Markets. Figure 5.3 shows that most EVA adoption took place in the period 1990-1996.

Figure 5.3
Adoption Date



[28] Source: United States Securities and Exchange Commission, Washington, D.C. 2059. RR Donnelley & Sons Co, FORM 10-Q, May 7th 1997.

Assessing abnormal performance is tricky. Barber and Lyon (1996) favour the use of control firms in calculating abnormal return that would alleviate the problems of the misspecification that resulted from the bias occurring because of the inclusion of new listed firms in the market index portfolio and the rebalancing process of market index (portfolio). Given the advantages of the control firm approach, I followed in the steps of Wallace (1997). I began by determining the Standard Industrial Classification (SIC) code of adopter companies using the Centre for Research in Security Prices CRSP and COMPUSTAT database. Subsequently, I selected a sample of the best matched controlling firms that closely resembled the event firm to compare their performance. The prices and returns data of both adopting and control firms that were used to analyse the long-term effects of adoption were collected using CRSP. The selection processes of the controlling firms were based on the following criteria:

1. The company should have the same 4-digits SIC code (Same industry sector). If not, we chose the best matched company with a 3-digits SIC code.
2. Size: we used the total asset and number of outstanding common shares in the year prior to the year of adoption to match adopters and control firms.
3. Time period: the control firm should have sufficient annual data and its operating period should match that of the adopting firms' operating period.

Table 5.3 provides a breakdown of firms adopting EVA and the year of adoption, the main control firms and the SIC code respectively.

Another potential problem might be self-selection bias. This is mainly due to the possibility that those firms that selected EVA belong to a certain class of performance. Thus, comparing EVA adopters to non-EVA adopters might simply reflect their inherent superior performance and not the effect of adopting EVA. Fortunately, this concern is not justified for the simple reason that the control firms use residual income and this latter is very similar to EVA. Given that the control firms are matched as precisely as possible, the difference in performance, if any, can be relatively safely attributed to the adoption of EVA.

Table (5.3) EVA Adopting Companies 1987-2001(USA)

NO.	SAMPLE COMPANY	ADOPTION YEAR	CONTROL COMPANY	SIC CODE
1	COCA COLA	1987	PEPSICO INC	2080
2	CSX CORPORATION	1988	SANTA FE FINANCIAL CORP	6711
3	CILCORP	1989	ALLETE INC	4931
4	CRANE CO	1990	WHITTAKER CORP	3490/3494
5	BRIGGS & STRATTON	1990	STEWART & STEVENSON SVCS INC	3510/3519
6	QUAKER OATS	1991	RALSTON PURINA CO	2040/2043
7	BALL CORP	1992	CROWN HOLDINGS INC	3221
8	WHIRLPOOL CORP	1992	AKTIEBOLAGET ELECTROLUX	3630
9	AT&T	1992	G T E CORP	4813
10	SCHERER, R.P.	1992	FOREST LABS INC	2834
11	WELLMAN	1993	ASHLAND INC NEW	2824
12	GRAINGER, W.W.	1993	WAXMAN INDUSTRIES INC	5063
13	MANITOWOC CO	1993	ASTEC INDUSTRIES INC	3531
14	DIGITAL EQUIPMENT CORP	1993	APPLE INC	3573
15	FURON CORP.	1993	WYNNS INTERNATIONAL INC	3079
16	HARNISCHFEGER IND. INC.	1993	APPLIED MATERIALS INC	3536
17	HEWLETT PACKARD CO.	1993	HITACHI LIMITED	3571
18	RUBY TUESDAY INC.	1993	WORLDWIDE RESTAURANT CNCPTS INC	5812
19	SMITH INTERNATIONAL INC.	1993	CABOT CORP	3533
20	TRANSAMERICA CORP	1993	LOEWS CORP	6711
21	ACXIOM CORP	1994	MCGRAW HILL COS INC	7370
22	BOISE CASCADE CORP	1994	BT OFFICE PRODUCTS INTL INC	2421
23	FLEMING COMPANIES INC	1994	NASH FINCH COMPANY	5141
24	GEORGIAPACIFIC GROUP	1994	WEYERHAEUSER CO	2435
25	LILLY (ELI) & CO	1994	WYETH	2834
26	SPRINT FON GROUP	1994	CENTEL CORP	4813
27	CENTURA BANKS INC	1994	AMERICAN FLETCHER CORP	6036
28	CORE INDUSTRIES INC.	1994	WHITTAKER CORP	3429
29	DEERE & CO.	1994	KUBOTA CORP	3523
30	EASTMAN CHEMICAL CO.	1994	ROHM & HAAS CO	3861

Table (5.3) continued.

NO.	SAMPLE COMPANY	ADOPTION YEAR	CONTROL COMPANY	SIC CODE
31	GENCORP INC.	1994	LOCKHEED MARTIN CORP	3011
32	INCSTAR CORP.	1994	A M A G PHARMACEUTICALS INC	2830
33	INSTEEL INDUSTRIES	1994	NATIONAL STANDARD CO	3310
34	OHIO EDISON CO.	1994	NORTHEAST UTILITIES	4911
35	REYNOLDS METALS CO.	1994	KAISERTECH LTD	3353
36	TENNECO INC.	1994	CHAMPION PARTS INC	3714
37	WALLACE COMPUTER SERVICES	1994	MOORE WALLACE INC	2761
38	ZOLTEK COS. INC.	1994	WOODWARD INC	3620
39	ARMSTRONG HOLDINGS INC	1995	NEWELL RUBBERMAID INC	2511
40	BARD (C.R.)	1995	TELEFLEX INC	5086
41	PERKINELMER INC	1995	BIO RAD LABORATORIES INC	3823
42	SPX CORP	1995	GIDDINGS & LEWIS INC WIS	3540
43	AMERICAN PRECISION IND.	1995	FRANKLIN ELECTRIC INC	3443
44	ARMSTRONG WORLD INDUSTRIES INC.	1995	E G & G INC (VISKASE COMPANIES)	2511
45	BECKMAN INSTRUMENTS INC.	1995	PERKINELMER INC	5311
46	EMERSON ELECTRIC CO.	1995	PANASONIC CORP	3621/3823
47	IPALCO ENTERPRISES INC.	1995	TUCSON /U N S ENERGY CORP	4911
48	KAISER ALLUMINUM CORP.	1995	MAXXAM INC	3334
49	KNIGHT–RIDDER INC.	1995	NEW YORK TIMES CO	2711
50	NEW JERSEY RESOURCES	1995	ATMOS ENERGY CORP	4924
51	SEQUENT COMPUTER	1995	STRATUS COMPUTER INC	3570
52	ADC TELECOMMUNICATIONS INC	1996	TELLABS INC	3679
53	BAUSCH & LOMB INC	1996	CHIRON CORP	3861
54	BECTON DICKINSON & CO	1996	BARD C R INC	3841
55	DONNELLEY (R R) & SONS CO	1996	BOWNE & CO INC	3229
56	GUIDANT CORP	1996	MEDTRONIC INC	3841
57	KANSAS CITY POWER & LIGHT	1996	C M P GROUP INC	4911
58	OLIN CORP	1996	F M C CORP	2810
59	SILICON VY BANCSHARES	1996	AMSOUTH BANCORPORATION	6022/6710
60	TUPPERWARE CORP	1996	ENVIRODYNE INDUSTRIES INC	3089

Table (5.3) continued.

NO.	SAMPLE COMPANY	ADOPTION YEAR	CONTROL COMPANY	SIC CODE
61	MILLER HERMAN	1996	H N I CORP	2531
62	CINCINNATI MILACRON	1996	KENNAMETAL INC	3541
63	HACH CO.	1996	COHERENT INC	3820
64	KLLM TRANSPORT SERVICES	1996	MATLACK SYSTEMS INC	4210
65	NEW ENGLAND BUSINESS SERVICES	1996	ENNIS INC	2761
66	QUAKER STATE	1996	TESORO CORP	2911
67	STRATTEC SECURITY CORP	1996	F M C CORP	8740
68	TEKTRONIX	1996	SNAP ON INC	3825
69	CDI CORP	1997	ROBERT HALF INTL INC	3269
70	GC COMPANIES INC	1997	MARCUS CORP	7830
71	JOHNSON OUTDOORS INC	1997	ELECTRO SCIENTIFIC INDS INC	3940
72	MILLENNIUM CHEMICALS INC	1997	BIG THREE INDS INC	2813
73	PHARMACIA CORP	1997	BAUSCH & LOMB INC	2823
74	RYDER SYSTEM INC	1997	ROLLINS TRUCK LEASING CORP	6159
75	TENET HEALTHCARE CORP	1997	UNIVERSAL HEALTH SERVICES INC	8062
76	WEBSTER FINL CRP WATERBURY	1997	AMSOUTH BANCORPORATION	6035
77	FEDERALMOGUL CORP	1998	DANA HOLDING CORP	3562
78	MATERIAL SCIENCES CORP	1998	SHAW GROUP INC	3470
79	MONTANA POWER CO	1998	C H ENERGY GROUP INC	4911
80	PENNEY (J C) CO	1998	DILLARDS INC	5311
81	STANDARD MOTOR PRODS	1998	HARBINGER GROUP INC	3694
82	BRADLEY PHARMACEUTICALS	1998	BALCHEM CORP	2830/5120
83	BEST BUY CO INC	1998	RADIOSHACK CORP	5732
84	INTERNATIONAL MULTIFOODS	1999	RALSTON PURINA CO	2041
85	TOYS R US INC	1999	MICHAELS STORES INC	6711
86	GENESCO	1999	FOOT LOCKER INC	2341
87	MOLSON COORS	1999	ANHEUSER BUSCH COS INC	2082
88	SCHNITZER STEEL	2000	ENVIROSOURCE INC	3310
89	HARSCO	2001	DYNAMIC MATERIALS CORP	3446

Source: *Wallace, 1997 and Kleiman (1999), Stern Stewart & Co. brochure, Lexis-Nexis, Proxy Statement* and *10-Q report and Wall Street Journal.*

5.4 Methodology

Defenders of economic value added (EVA) claim that it helps to enhance the investment activity that leads to a notable market reaction (Stewart, 1991). The object of the current research is to examine whether the adoption of EVA has the predicted effects on investment behaviour. If the market reacts to this claim we should observe some enhancement in stock performance (abnormal return). In order to test this claim we use the event study methodology. In practice event study methodology has been used for two fundamental reasons: 1) to test the market efficiency, particularly testing the null hypothesis that the market (price) incorporates all the public information efficiently and 2) to assess the impact of some event announcement on the firm's wealth.

Fama *et al.* (1969) made two modifications to the event study methodology which have later become standard. First, in their response to the market's stationarity concern they suggested five to seven years data as an optimal period for monthly observation studies. Second, they stated that if the event date is included in the event's window to estimate the parameters, the estimation process will lead to a bias coefficient because the disturbances are non-zero. This bias is in decline as long as the data periods matched that of Fama *et al.* (1969).

The current research will use the same methodology as Wallace's (1997) except that while Wallace's sample consists of those firms adopting a residual income-based management system, this research uses only firms adopting EVA for incentive compensation purposes. Moreover, while Wallace used a five-year return to conduct his research, the current research uses the monthly market returns and focuses on long-term abnormal stock return where we use statistics to detect monthly abnormal returns for the period 1960-2012. In order to estimate the parameters of the return equation, our sample includes observations since the 1960s prior to the adoption, the year of adoption, and up to the year 2012 after the adoption. The estimated event study window is set between 30 months prior to the adoption date and 30 months after the adoption. However, as it is difficult to determine the accurate date of EVA adoption we consider the month of December, the earliest year the company released the adoption of EVA, as the event date.

Many studies have discussed and examined the long-term financial performances after the occurrences of certain events such as the IPO, mergers and acquisitions and the most popular event, the cash dividends. One common feature of these studies is that of the classical event approach, which fully intended to investigate very short-term events. In a string of remarkable papers, Barber and Lyon (1996, 1997) and Lyon, Barber, and Tsai (1999), revealed that the standard classical event study framework can lead to many partialities when applied to the measurement of long-term abnormal performances and recommended further study for such long-term events analysis. Consequently, Fama (1998) raised two important key issues regarding measuring long-term abnormal returns: first, the model's ability to correct for risk when estimating abnormal returns is quite low and second, the estimation of abnormal returns is probably subject to a range of statistical biases.

In the literature there are two methods to test the events and detect a long-run abnormal stock return: the cumulative abnormal return (hereafter, CAR) and the Buy and Hold Abnormal Return (hereafter, BHAR). The main difference between CAR and BHAR is mainly attributed to the compounding of the monthly return; while BHAR incorporates the effect of compounding CAR does not (Barber and Lyon, 1997).

Regardless of the methodology used to measure the performance of the EVA adopter, CAR or BHAR, we need to measure the abnormal return. The abnormal return is the difference between the actual return and the expected return of a security. Events in the theory of finance can usually be classified as information that has not already been contained in the share's market price.

According to the market model, the most popular in practice, for each asset *i* the asset returns are given by:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$

$$where\ E[\varepsilon_{it}] = 0\ and\ Var[\varepsilon_{it}] = \sigma^2_{\varepsilon t}$$

where R_{it} is the return on individual asset, α_i, β_i are parameters, and R_{mt} is the return on the market portfolio[29] (or the control firms, as the current research intends using) . Following this the parameter estimates of the market model through the estimation period were used to calculate the abnormal return, that is:

[29] In application, a broad-based stock index, such as S&P 500 or value weighted indices, are used as the market portfolio.

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt}$$

where $\hat{\alpha_i}$, $\hat{\beta_i}$ are the parameters estimated during the estimation period, $and\ AR_{it}$ represents the abnormal return. The average abnormal return (AAR_s) during month s can be defined as:

$$AAR_s = \frac{1}{N_s}\sum_{i=1}^{Ns} AR_{is}$$

where AR_{is} is the abnormal return estimator for security *i* and N_s is the number of the companies in the sample during month *s*. The estimator of the cumulative average abnormal return in the window of (s_1,s_2) is:

$$CAAR_{s_1 s_2} = \sum_{t=s_1}^{s_2} AAR_t$$

Then, as we refer to the abnormal return in our study as the difference between the return of the event firm and that of the matched firm or portfolio index (S&P500), the average CAR, is the summation of the average abnormal return (AR), are given as follows:

$$CAR_T = \sum_{t=1}^{T} AR_t = \sum_{t=1}^{T} (\frac{1}{n_t}) \sum_{t=1}^{n_t} (R_{it}^a - R_{it}^b).$$

where R_{it}^a indicates the return on event firm *i* in event month *t*, R_{it}^b indicates the return on the benchmark firm (control firm) or portfolio during the same period, and n_t indicates the number of event firms in event month *t*.

The second method used to calculate the abnormal return is BHAR which is defined as the compound returns on the event firm less the compound return on a control firm / reference portfolio- that is BHAR:

$$BHAR_{i\tau} = \left[\prod_{t=1}^{\tau}(1+R_{it}^a)\right] - \left[\prod_{t=1}^{\tau}(1+R_{it}^b)\right]$$

where τ is the period of investment in months, R_{it}^{a} is the return on the event firm (adopter firm) *i* in month *t*. R_{it}^{b} is the benchmark returns. As our main method to test the event is BHAR it is more efficient to highlight the skewness problem inherited within the process of making inferences using BHAR. This problem, as Barber and Lyon (1997) reported, is mainly attributed to new listing and rebalancing biases. In order to conduct the significance test in event time using BHAR, the following conventional *t*-statistic is used:

$$t_{\tau} = \frac{\overline{BHAR}_{\tau}}{\sigma(BHAR_{i\tau}) / \sqrt{N}}$$

where $\overline{BHAR}_{\tau}$ is the cross sectional sample mean, $\sigma(BHAR_{i\tau})$ is the cross-sectional standard deviation, and N is the number of EVA adopter firms. As this conventional test is likely to be skewed, we use a bootstrap correction, originally constructed by Johnson (1978), that is:

$$SKadj - t_{\tau} = \sqrt{N}\left(S + \frac{1}{3}\hat{\gamma}S^{2} + \frac{1}{6N}\hat{\gamma} \right)$$

where $\hat{\gamma}$ is the coefficient of skewness, and $S \equiv \overline{BHAR}_{\tau} / \sigma(BHAR_{i\tau})$. This adjustment was recommended by Lyon *et al.* (1999) because of the assumed skewness of BHAR returns. They use the standard bootstrap procedure with bootstrap sample size of $N/4$. Similarly, Kothari and Warner (1997) state that, drawing statistical inferences from a bootstrap approach is likely to be a better technique for statistical testing of long-term stock abnormal performance. However, while bootstrapping is the best action to remedy skewness it fails to address the theme of cross-sectional correlation and Heteroscedasticity.

To my knowledge, the inherent skewness problem cannot be addressed in a cross-sectional test and although Mitchell and Stafford (2000) argue that for t-statistics to be corrected for cross-sectional dependence these are not t-statistics that are simultaneously corrected for skewness. In any event, Mitchell and Stafford (2000) strongly preferred to use calendar time methods to allow for cross-sectional correlations. The issue of Heteroscedasticity is not addressed by conducting the ordinary bootstrap either. We would recommend the use of the wild bootstrap instead. This standard procedure has the advantage that it maintains the first and second moments of the parent distribution.

The difference between these corrections methods, the ordinary and wild bootstrap, is simple. Assume that the residuals from a regression are $\hat{\varepsilon}_i$ (in our case $\hat{\varepsilon}_i = BHAR_i - \overline{BHAR}$). In the regular ordinary bootstrap we resample by drawing $N^* < N$ residuals, $\hat{\varepsilon}_i^*$, with replacement from the series $\hat{\varepsilon}_i$. In the wild bootstrap we produce the bootstrap residuals $\hat{\varepsilon}_i^*$ as the product of the original residuals and an independent random variable, η_i , with zero mean and unit variance. This ensures that the bootstrap variance will be the same as that of the parent distribution. For example, η_i can be standard normal and hence

$E(\hat{\varepsilon}_i^*) = E(\eta_i)E(\hat{\varepsilon}_i) = 0$ and $V(\hat{\varepsilon}_i^*) = V(\eta_i)V(\hat{\varepsilon}_i) = V(\hat{\varepsilon}_i)$

However, if the data is skewed, re-sampling based on the standard normal will yield zero skewness since $E(\eta_i^3) = 0$. To preserve skewness, Liu (1988) and Mammen (1993) suggest ways of obtaining $E(\eta_i^3) = 1$. One suggestion is:

$$\eta_i = \begin{cases} \dfrac{1+\sqrt{5}}{2} & w.p. \quad p = \dfrac{\sqrt{5}-1}{2\sqrt{5}} \\ \dfrac{1-\sqrt{5}}{2} & w.p. \quad 1-p \end{cases}$$

This will guarantee that $E(\eta_i) = 0$, and $E(\eta_i^2) = E(\eta_i^3) = 1$. However, this scheme will not preserve the kurtosis of the parent distribution since $E(\eta_i^4) = 2$. An alternative scheme (see Davidson *et al.* (2007)) is to use

$$\eta_i = \begin{cases} 1 & w.p. \quad p = \dfrac{1}{2} \\ -1 & w.p. \quad 1-p \end{cases}$$

This will preserve the mean, variance and kurtosis ($E(\eta_i) = 0$, and $E(\eta_i^2) = E(\eta_i^4) = 1$) but not skewness ($E(\eta_i^3) = 0$). Accomplishing both preservations is not possible. Davidson *et al.* (2007) recommend some combination that will achieve partial refinement. However, here we advocate combining the skewness adjusted t-statistic with the kurtosis preserving wild bootstrap. Providing the skewness adjustment of Johnson (1978) is fairly accurate, the parent distribution of the adjusted statistic is expected to be symmetric. Therefore, achieving $E(\eta_i^4)=1$ will be more important than achieving $E(\eta_i^3)=1$. Accordingly, we adopt this combined Skewness-Adjusted and Kurtosis Preserving Bootstrap approach in our tests.

A further serious problem that we confront both in the EVA adopter sample and the control firm sample is that of firms that de-list within the measurement period. Delisting can result from acquisition, bankruptcy or going private. Liu and Strong (2006) replace de-listed firm returns by either zero or the risk-free rate. They find similar results in both cases. Lyon, Barber and Tsai (1999) and Mitchell and Stafford (2000, p.298) replace all de-listed firms with the benchmark return. This has the potential to create an upward bias in the estimated BHAR returns, since some of these de-listings are bankruptcies. However, for the purpose of our study we use the following rules. If an observation is missing within a valid set of observations we set the return equal to zero. If the de-listings are due to bankruptcy we replace the missing return by -1. Finally, if the delisting is due to a value preserving event such as a merger, we replace the return by the benchmark return. We use CRSP description as a distinguishing feature of the delisted firms. The Delisting Code is a 3-digit integer code. It either (1) indicates that a security is still trading or (2) provides a specific reason for delisting. All delisting codes are categorized by the first digit of the delisting code. The second and third digits of the delisting codes provide further details of delisting events. Additional delisting codes, specific to various delisting categories, have been created to indicate when an issue is closed to further research, or if the issue is pending further research. The most important codes are 241, 231, 233, 331, 251, 552 and 574. These categories of delisting are most likely to be stocks that are either worthless or some distance from providing shareholders with any terminal value, and consequently we treat these cases as if investors lost all their investment. Table 5.4 describes these delisting codes.

It should be noted that benchmarking using the pre-event period from the same event firm is not used in this thesis. Previous authors have warned against using this approach. Specifically, Wallace (1997, p.281) states “Two major validity threats to the analysis of an interrupted time series are the possibility that (1) some event other than the treatment (a history threat), or (2) natural changes in a firm through time (a maturation threat) cause the change in the time series (Cook and Campbell, 1979). The using of a properly selected control group decreases these threats since both treatment and control firms are subject to potential omitted variables and primarily differ based on the partitioning variable.”

Table 5.4 Codes and Descriptions of Delisting Codes

Code	Category
100	Active
200	Mergers
300	Exchanges
400	Liquidations
500	Dropped
600	Expirations
900	Domestics that became Foreign
Source: Centre for Research in Security Prices CRSP	

5.5 Cumulative Return Results

As discussed earlier we intend to test the EVA adoption event using CAR and BHAR approaches. The following section will shed light on the statistical properties of returns, abnormal returns and aggregate abnormal returns, BHAR and CAR, and the empirical results obtained and discuss the effects of bootstrapping. The statistics are as follows: the mean, the conventional t-test, standard deviation, minimum, maximum, skewness, kurtosis, the 25th percentile and 75th percentile. A reduced version of tables was used to discuss our findings while the complete version of tables showing the full 60 months event period for all cases is given in Appendix 2.

Table 5.5.1 presents the statistical behaviour of adopter firms' return for the first year and the last year of the events window together with the mean returns of January, June and December of each year in between. The results show that all the adopter firms have a positive mean return in the first year except for the month of March where the mean return is negative and insignificant (-0.007, *t*-statistic = -0.697) and then the mean return remains positive in the next three years where January in year four has the highest significant mean return (0.049, *t*-statistic = 2.609). In year five, the adopter firms start with a negative and insignificant mean return (-0.003, *t*-statistic -0.262) and then result in being mostly insignificant, to reach the highest and significant mean return through the five year window (0.052, *t*-statistic = 4.204). Subsequently, the mean return of whole adopter firms decreases and continues to be insignificant. The last two months of year five reveal a poor and insignificant increase in the mean return. The EVA adopter firms exhibit lower skewness and kurtosis than matching firms. The result shows that adopter firms have the highest skewness (3.270) and kurtosis (22.470) in month 25. One important observation is that the adopter firms begin to generate a negative return during the first three months after the adoption event.

Similarly, Table 5.5.2 describes the same descriptive statistics of matching firms (control firms). The matching firms are notable for its positive mean return (few with negative mean returns). The cross-sectional mean matching firms' return fluctuates from -0.003 to 0.028. Another notable feature of matching firms is that skewness and kurtosis are relatively higher than in adopter firms and highly volatile, attaining a maximum of 8.1 (skewness) and 71.74 (kurtosis) in month 42. However, the volatility difference between the benchmark and the event asset may seriously distort the performance of tests on CAR. Unlike the adoption firms, the match firm shows a positive return during the three months following the adoption date.

Turning to the abnormal return (AR) which is obtained by subtracting the matching firms' return from EVA adopters' returns, Table 5.5.3 shows that the whole adopter firms' performance varies from month to month. Month 11, 52 and 56 are the only months that appear to be statistically significant where AR and *t*- Conventional are (0.027, 2.337), (0.078, 4.579) and (-0.044, -2.641) respectively. It is common to find adopter firms underperforming the matching firms in many months during the event window. However, the matching firms showed some performance improvement during the subsequent months of the date of the adoption. Put simply the matching firms outperform adopting firms in most of the months that followed the adoption.

Table 5.5.4 reveals an interesting story about the overall performance, the cumulative abnormal return (CAR) for the 10 years after the adoption date. Most of the CARs appear to be positive but insignificant except for the months 27, 28, 29 and 30 which are three years after the event date, where the mean return is positive and significant. The result also shows up as positive but provides an insignificant performance following the event date where the mean return increases dramatically for a few months after the adoption released then the performance decreases in year 10 where the adopters underperform the matching firms in the last 4 months in year 10. Figure 5.5.3 depicts AR against CAR based on matching firms' benchmarking.

Table 5.5.1 Summary statistics for adopter firm return

Month	N	Mean	t-stat	St. Dev	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.028	2.549	0.103	-0.266	0.376	0.347	1.679	-0.031	0.085
2	87	0.016	1.729	0.087	-0.161	0.444	1.962	7.116	-0.035	0.042
3	87	-0.007	-0.697	0.090	-0.284	0.332	0.401	2.201	-0.068	0.045
4	87	0.028	3.007	0.087	-0.281	0.235	0.124	1.395	-0.017	0.068
5	87	0.018	2.509	0.068	-0.145	0.230	0.281	0.717	-0.025	0.053
6	87	0.008	0.924	0.077	-0.177	0.208	0.283	0.129	-0.039	0.053
7	87	0.010	0.833	0.109	-0.215	0.324	0.363	0.331	-0.059	0.074
8	87	0.007	0.599	0.113	-0.469	0.343	-0.795	3.365	-0.040	0.073
9	87	0.015	1.615	0.087	-0.216	0.198	-0.278	-0.008	-0.033	0.070
10	87	0.002	0.252	0.075	-0.231	0.160	-0.382	0.537	-0.035	0.051
11	87	0.028	2.762	0.095	-0.214	0.300	0.260	0.649	-0.028	0.082
12	87	0.018	2.000	0.083	-0.188	0.260	-0.197	0.615	-0.030	0.066
13	87	0.004	0.380	0.105	-0.327	0.479	0.513	4.981	-0.048	0.054
18	87	0.027	2.434	0.105	-0.273	0.484	1.296	4.925	-0.027	0.054
24	87	0.003	0.313	0.090	-0.247	0.220	-0.059	-0.145	-0.074	0.061
25	87	0.031	1.636	0.179	-0.543	1.200	3.270	22.470	-0.027	0.064
26	87	0.022	2.074	0.099	-0.206	0.403	0.769	2.926	-0.033	0.068
27	87	0.033	1.869	0.165	-0.407	0.934	2.592	12.668	-0.038	0.067
28	87	0.014	1.016	0.130	-0.308	0.631	1.122	5.422	-0.045	0.073
29	87	0.017	1.657	0.096	-0.280	0.316	-0.022	2.444	-0.036	0.065
30	87	0.005	0.509	0.087	-0.242	0.299	0.257	1.603	-0.038	0.063
31	87	-0.013	-1.157	0.106	-0.307	0.395	0.536	3.025	-0.066	0.043
32	87	-0.033	-2.527	0.120	-0.434	0.342	-0.521	1.906	-0.076	0.029
33	87	-0.014	-1.158	0.109	-0.473	0.237	-1.246	4.010	-0.050	0.049
34	87	0.008	0.690	0.110	-0.402	0.281	-0.478	1.829	-0.042	0.078
35	87	0.034	2.356	0.136	-0.487	0.495	-0.232	4.345	-0.033	0.094
36	87	0.019	1.613	0.109	-0.319	0.393	0.230	1.717	-0.044	0.081
37	87	0.049	2.609	0.176	-0.295	0.968	2.486	10.111	-0.033	0.082
42	86	0.016	0.963	0.150	-0.520	0.609	0.447	3.843	-0.054	0.071
48	85	0.014	0.994	0.128	-0.265	0.391	0.351	1.198	-0.058	0.074
49	85	-0.003	-0.262	0.096	-0.257	0.375	0.844	3.273	-0.070	0.041
50	85	0.000	-0.016	0.134	-0.393	0.430	0.681	2.207	-0.077	0.065
51	85	0.003	0.239	0.109	-0.360	0.368	0.213	1.678	-0.078	0.065
52	85	0.052	4.204	0.114	-0.251	0.437	0.499	0.929	-0.020	0.121
53	85	0.022	1.769	0.115	-0.254	0.599	1.434	6.462	-0.041	0.073
54	85	0.017	1.299	0.120	-0.340	0.383	0.598	1.488	-0.060	0.061
55	84	-0.020	-1.268	0.143	-0.644	0.309	-1.241	5.425	-0.080	0.058
56	84	-0.032	-2.207	0.132	-0.536	0.315	-0.610	2.925	-0.094	0.021
57	84	-0.008	-0.809	0.095	-0.343	0.250	-0.232	1.994	-0.071	0.042
58	83	-0.009	-0.514	0.153	-0.811	0.311	-1.607	8.262	-0.078	0.076
59	83	0.028	1.632	0.154	-0.335	0.900	2.204	12.396	-0.035	0.075
60	82	0.006	0.432	0.118	-0.429	0.422	0.295	3.540	-0.052	0.048

Table 5.5.2 Summary statistic for matching firms return

Month	N	Mean	t-stat	St. Dev	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.005	0.535	0.078	-0.302	0.260	-0.246	3.375	-0.035	0.039
2	87	0.012	0.780	0.145	-0.297	1.006	3.703	25.593	-0.047	0.054
3	87	0.000	-0.014	0.117	-0.611	0.430	-1.728	11.232	-0.023	0.048
4	87	0.024	2.301	0.097	-0.167	0.372	0.957	1.599	-0.029	0.064
5	87	0.000	-0.031	0.108	-0.263	0.497	1.211	5.151	-0.043	0.036
6	87	0.014	1.450	0.090	-0.250	0.311	0.452	1.768	-0.034	0.058
7	87	0.038	3.028	0.118	-0.206	0.556	1.894	5.809	-0.021	0.076
8	87	0.022	1.511	0.136	-0.313	0.914	3.418	21.616	-0.020	0.047
9	87	0.015	1.871	0.074	-0.176	0.226	-0.102	0.668	-0.025	0.061
10	87	0.002	0.172	0.089	-0.247	0.502	1.808	11.220	-0.037	0.035
11	87	0.001	0.111	0.081	-0.396	0.145	-1.529	5.858	-0.022	0.051
12	87	0.024	2.490	0.089	-0.438	0.269	-1.077	8.266	-0.012	0.064
13	87	0.017	1.905	0.085	-0.143	0.311	0.982	1.526	-0.027	0.062
18	87	0.018	2.008	0.084	-0.231	0.238	0.020	0.809	-0.035	0.073
24	87	0.014	1.464	0.091	-0.357	0.249	-0.568	3.281	-0.033	0.068
25	87	0.000	0.047	0.087	-0.256	0.154	-0.848	0.686	-0.023	0.049
26	87	-0.008	-0.805	0.094	-0.388	0.195	-1.191	3.455	-0.039	0.051
27	87	-0.011	-0.922	0.114	-0.439	0.337	-0.408	2.640	-0.059	0.040
28	87	0.013	1.188	0.104	-0.272	0.383	0.546	2.365	-0.027	0.064
29	87	0.011	0.817	0.129	-0.395	0.406	-0.357	2.738	-0.027	0.073
30	87	0.017	1.759	0.089	-0.244	0.252	0.011	0.829	-0.026	0.062
31	87	0.020	1.611	0.113	-0.306	0.623	1.682	9.072	-0.026	0.072
32	87	0.014	1.178	0.114	-0.206	0.385	0.574	0.999	-0.051	0.065
33	87	0.004	0.418	0.094	-0.179	0.415	0.977	3.401	-0.049	0.046
34	87	0.025	1.003	0.234	-0.224	2.000	7.133	60.273	-0.044	0.044
35	87	0.036	2.628	0.127	-0.228	0.604	1.986	7.062	-0.019	0.076
36	87	0.013	1.289	0.096	-0.251	0.338	0.753	2.362	-0.041	0.062
37	87	0.008	0.646	0.119	-0.318	0.352	0.100	1.359	-0.036	0.071
42	87	0.072	1.876	0.358	-0.317	3.227	8.100	71.735	0.000	0.089
48	87	0.031	2.106	0.137	-0.216	0.773	2.635	11.500	-0.028	0.058
49	87	0.015	1.314	0.103	-0.286	0.485	1.074	4.960	-0.040	0.048
50	87	0.014	1.090	0.117	-0.286	0.596	1.291	6.501	-0.039	0.068
51	87	0.007	0.575	0.107	-0.282	0.344	0.506	1.475	-0.038	0.036
52	87	-0.025	-2.161	0.108	-0.412	0.250	-0.587	2.089	-0.074	0.025
53	87	-0.004	-0.378	0.103	-0.488	0.223	-1.418	5.534	-0.034	0.048
54	87	0.010	0.920	0.097	-0.234	0.393	0.972	3.520	-0.032	0.042
55	86	0.003	0.236	0.099	-0.261	0.310	0.523	1.764	-0.053	0.039
56	86	0.014	1.144	0.112	-0.197	0.567	1.898	7.247	-0.045	0.049
57	86	-0.001	-0.098	0.125	-0.382	0.395	0.065	2.282	-0.050	0.038
58	86	0.014	1.393	0.094	-0.291	0.407	0.610	3.651	-0.041	0.068
59	85	0.025	2.504	0.093	-0.180	0.306	0.450	0.741	-0.024	0.082
60	85	0.006	0.604	0.094	-0.270	0.283	0.086	1.305	-0.032	0.055

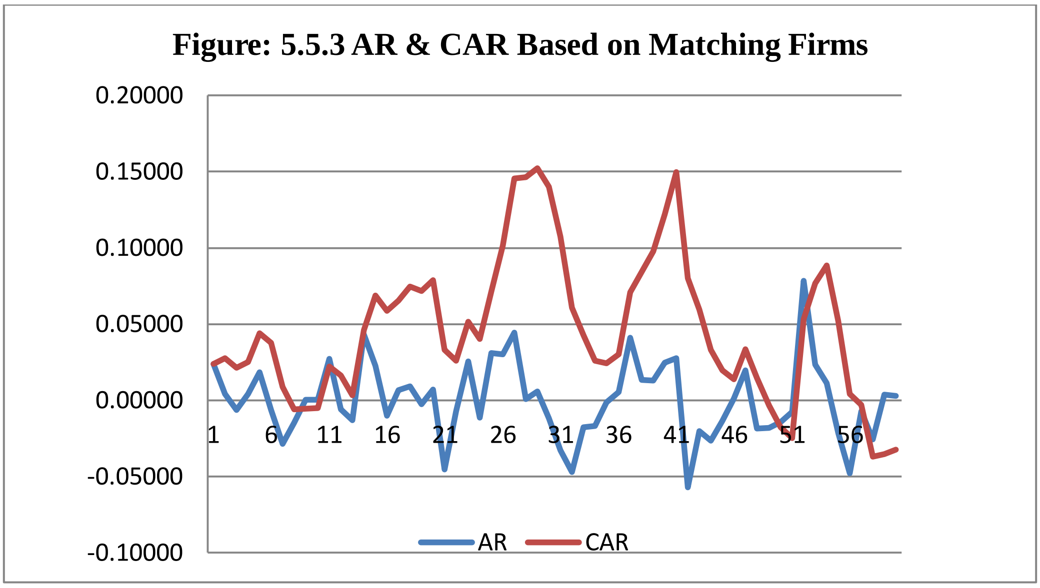
Table 5.5.3 Matching firm based abnormal returns (AR)

Month	N	Mean	t-stat	St. Dev	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.024	1.599	0.138	-0.259	0.565	1.104	3.605	-0.061	0.084
2	87	0.004	0.233	0.159	-0.761	0.530	-0.685	6.788	-0.046	0.063
3	87	-0.007	-0.453	0.134	-0.360	0.509	0.711	2.756	-0.068	0.045
4	87	0.004	0.310	0.122	-0.305	0.401	0.288	0.763	-0.090	0.090
5	87	0.019	1.443	0.120	-0.403	0.318	-0.513	1.788	-0.045	0.091
6	87	-0.006	-0.514	0.115	-0.380	0.233	-0.504	0.659	-0.075	0.074
7	87	-0.029	-1.849	0.144	-0.601	0.324	-0.479	2.117	-0.123	0.052
8	87	-0.015	-0.703	0.196	-1.190	0.302	-3.336	17.218	-0.052	0.076
9	87	0.000	0.020	0.110	-0.271	0.263	-0.071	-0.176	-0.084	0.074
10	87	0.000	0.030	0.120	-0.561	0.291	-0.960	4.838	-0.057	0.054
11	87	0.027	2.337	0.109	-0.207	0.347	0.744	0.764	-0.041	0.066
12	87	-0.006	-0.419	0.131	-0.416	0.531	-0.179	4.303	-0.049	0.057
13	87	-0.013	-1.131	0.107	-0.361	0.233	-0.543	1.182	-0.071	0.051
18	87	0.009	0.656	0.133	-0.377	0.431	0.214	1.075	-0.067	0.083
24	87	-0.011	-0.900	0.117	-0.295	0.286	-0.079	-0.205	-0.092	0.071
25	87	0.031	1.492	0.193	-0.586	1.096	1.886	10.732	-0.071	0.102
26	87	0.030	2.271	0.123	-0.315	0.442	0.525	2.012	-0.043	0.082
27	87	0.044	2.221	0.186	-0.345	0.934	1.475	5.798	-0.047	0.135
28	87	0.001	0.050	0.167	-0.479	0.631	0.452	2.678	-0.103	0.094
29	87	0.006	0.355	0.150	-0.442	0.391	-0.044	0.909	-0.086	0.078
30	87	-0.012	-0.887	0.126	-0.364	0.328	-0.328	0.815	-0.049	0.070
31	87	-0.033	-2.186	0.140	-0.585	0.445	-0.093	3.718	-0.101	0.034
32	87	-0.047	-2.785	0.157	-0.588	0.342	-0.857	1.392	-0.117	0.061
33	87	-0.018	-1.159	0.143	-0.473	0.316	-0.915	2.029	-0.069	0.062
34	87	-0.017	-0.632	0.252	-1.926	0.421	-5.049	38.721	-0.089	0.106
35	87	-0.001	-0.075	0.173	-0.615	0.546	-0.571	3.054	-0.071	0.079
36	87	0.006	0.377	0.139	-0.409	0.358	-0.387	0.768	-0.074	0.092
37	87	0.041	1.853	0.207	-0.493	0.968	1.144	4.721	-0.055	0.111
42	86	-0.057	-1.385	0.384	-3.144	0.682	-6.126	50.025	-0.110	0.065
48	85	-0.019	-0.892	0.192	-0.809	0.442	-1.386	4.719	-0.061	0.101
49	85	-0.018	-1.112	0.150	-0.560	0.399	-0.198	2.153	-0.087	0.060
50	85	-0.014	-0.784	0.167	-0.637	0.411	-0.330	1.971	-0.096	0.064
51	85	-0.007	-0.452	0.153	-0.448	0.354	-0.470	1.557	-0.086	0.078
52	85	0.078	4.579	0.158	-0.246	0.583	0.612	0.774	-0.017	0.165
53	85	0.024	1.443	0.150	-0.325	0.536	0.729	1.273	-0.076	0.098
54	85	0.011	0.706	0.149	-0.487	0.365	-0.258	1.267	-0.057	0.089
55	84	-0.021	-1.174	0.167	-0.660	0.432	-0.644	3.457	-0.077	0.040
56	84	-0.048	-2.641	0.166	-0.643	0.299	-0.871	1.714	-0.143	0.046
57	84	-0.007	-0.488	0.134	-0.450	0.403	-0.189	1.329	-0.071	0.078
58	83	-0.026	-1.354	0.174	-0.851	0.444	-1.224	6.419	-0.114	0.061
59	82	0.004	0.214	0.160	-0.331	0.823	1.348	7.517	-0.085	0.080
60	82	0.003	0.178	0.145	-0.429	0.421	0.207	0.865	-0.084	0.083

Table 5.5.4 Matching firm based cumulative abnormal returns (CAR)

Month	N	Mean	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.024	1.599	0.138	-0.259	0.565	1.104	3.605	-0.061	0.084
2	87	0.028	1.160	0.223	-0.968	0.980	0.037	7.417	-0.084	0.130
3	87	0.021	0.801	0.247	-0.624	0.932	0.711	2.073	-0.124	0.136
4	87	0.025	0.881	0.267	-0.615	1.055	0.588	2.004	-0.124	0.146
5	87	0.044	1.452	0.282	-0.657	0.799	0.310	0.567	-0.150	0.202
6	87	0.038	1.284	0.273	-0.768	0.900	0.180	1.042	-0.141	0.212
7	87	0.009	0.276	0.302	-0.705	0.983	0.206	1.239	-0.140	0.133
8	87	-0.006	-0.183	0.298	-0.768	0.752	-0.209	0.337	-0.165	0.173
9	87	-0.006	-0.180	0.290	-0.745	0.671	-0.311	0.146	-0.172	0.160
10	87	-0.005	-0.145	0.335	-0.915	0.808	-0.289	0.600	-0.191	0.196
11	87	0.022	0.595	0.345	-0.948	1.100	0.018	0.958	-0.183	0.227
12	87	0.016	0.388	0.388	-1.327	1.249	-0.336	1.909	-0.177	0.218
13	87	0.003	0.070	0.411	-1.352	1.416	-0.158	2.011	-0.195	0.211
14	87	0.046	1.058	0.408	-0.980	1.408	0.162	1.116	-0.160	0.246
15	87	0.069	1.526	0.420	-1.059	1.380	0.166	1.275	-0.163	0.277
16	87	0.059	1.303	0.420	-0.955	1.225	0.302	0.577	-0.188	0.294
17	87	0.065	1.429	0.426	-1.002	1.238	0.108	0.587	-0.184	0.319
18	87	0.075	1.502	0.463	-1.129	1.558	0.416	1.457	-0.192	0.285
19	87	0.072	1.319	0.508	-1.017	1.835	0.848	2.319	-0.246	0.346
20	87	0.079	1.454	0.505	-1.019	1.820	0.721	2.139	-0.254	0.334
21	87	0.033	0.674	0.460	-1.006	1.603	0.273	1.144	-0.306	0.290
22	87	0.026	0.527	0.459	-1.044	1.543	-0.023	0.814	-0.228	0.291
23	87	0.052	1.044	0.462	-1.094	1.446	-0.122	0.341	-0.261	0.356
24	87	0.040	0.754	0.500	-1.261	1.642	0.073	0.754	-0.292	0.369
25	87	0.071	1.272	0.523	-1.090	2.001	0.394	1.352	-0.355	0.345
26	87	0.101	1.708	0.554	-1.122	2.078	0.494	1.298	-0.235	0.371
27	87	**0.146**	**2.157**	0.630	-1.204	3.011	1.126	4.581	-0.252	0.414
28	87	**0.147**	**2.070**	0.661	-1.683	3.642	1.433	8.619	-0.189	0.450
29	87	**0.152**	**2.104**	0.675	-1.827	3.736	1.451	8.893	-0.225	0.392
30	87	**0.140**	**1.984**	0.659	-1.653	3.546	1.312	7.815	-0.206	0.451
31	87	0.108	1.480	0.678	-2.238	3.240	0.548	5.698	-0.229	0.430
32	87	0.061	0.819	0.690	-2.132	3.582	1.105	7.834	-0.355	0.365
33	87	0.043	0.541	0.739	-2.160	3.865	1.089	8.359	-0.344	0.381
34	87	0.026	0.312	0.770	-2.198	3.803	0.774	6.823	-0.391	0.397
35	87	0.024	0.279	0.817	-2.455	4.024	0.587	7.305	-0.366	0.454
36	87	0.030	0.343	0.818	-2.698	3.949	0.532	6.817	-0.376	0.442
37	87	0.071	0.847	0.783	-2.314	3.756	0.757	5.666	-0.342	0.468
38	87	0.084	1.022	0.771	-2.051	3.471	0.488	4.295	-0.288	0.455
39	87	0.098	1.173	0.776	-2.042	3.450	0.364	4.015	-0.272	0.469
40	87	0.122	1.424	0.800	-2.163	3.584	0.473	3.991	-0.249	0.527
41	87	0.150	1.757	0.796	-1.955	3.685	0.674	4.038	-0.287	0.607
42	86	0.080	0.821	0.903	-2.904	3.946	0.401	4.149	-0.365	0.621
43	86	0.060	0.585	0.945	-2.737	3.898	0.425	3.237	-0.421	0.650
44	86	0.033	0.314	0.984	-2.739	4.161	0.553	3.481	-0.464	0.583
45	86	0.020	0.171	1.071	-3.462	4.693	0.378	4.421	-0.472	0.605
46	85	0.014	0.116	1.099	-4.056	4.444	0.104	4.501	-0.495	0.535
47	85	0.033	0.280	1.101	-3.661	4.162	0.280	3.228	-0.500	0.523
48	85	0.015	0.119	1.146	-4.384	3.927	-0.023	3.568	-0.468	0.538
49	85	-0.003	-0.026	1.137	-4.288	4.037	0.117	3.556	-0.547	0.474
50	85	-0.017	-0.140	1.151	-4.287	4.277	0.233	3.597	-0.607	0.522
51	85	-0.025	-0.200	1.153	-4.242	4.371	0.181	3.441	-0.659	0.548
52	85	0.053	0.420	1.172	-4.424	4.365	0.049	3.528	-0.503	0.623
53	85	0.077	0.626	1.133	-4.291	4.290	0.103	3.763	-0.540	0.626
54	85	0.088	0.718	1.135	-4.519	3.803	-0.174	3.531	-0.493	0.666
55	84	0.052	0.408	1.171	-4.644	3.725	-0.301	3.115	-0.490	0.693
56	84	0.004	0.033	1.181	-4.931	3.412	-0.593	3.500	-0.542	0.635
57	84	-0.003	-0.022	1.186	-4.677	3.419	-0.424	2.862	-0.548	0.645
58	83	-0.037	-0.275	1.233	-4.787	3.553	-0.476	3.240	-0.511	0.628
59	82	-0.035	-0.262	1.215	-4.824	3.280	-0.465	3.126	-0.616	0.636
60	82	-0.032	-0.245	1.198	-4.538	3.115	-0.424	2.574	-0.581	0.655

Figure 5.5.3 Depicts AR against CAR based on matching firms



Another benchmark used to analyse the behaviour of the EVA adopter is the S&P500 market returns. Table 5.5.5 summarises the results and shows that the majority of mean returns are positive and significant. Only five months appear insignificant. The distribution of the mean return is Platykurtic (Kurtosis < 3) and left skewed (Skewness<0).

Table 5.5.6 describes the statistic of the abnormal return which in this case is obtained by subtracting the benchmarking (S&P500) return from the EVA adopters' returns. The mean return is negative and insignificant for the majority of months and negative and significant in months 13 and 58 where the mean return and *t*-statistic are (-0.024, -2.312) for month 13 and (-0.041, -2.509) for month 58.

Table 5.5.7 indicates that, in nearly all months, adopter firms outperform the market with small variances which does not increase in the best of cases more than 8.5%. The mean return based on CAR is positive and insignificant for most months except for months 34, 35 and 36. The months which are 4 years after the event date are negative and insignificant. All the CAR returns are skewed and leptokurtic, because of compounding process inherited in CAR calculations. However, the simple CAR based on matching firms and market benchmarking shows similar dynamics- the scale of the suggested outperformance is not the same. Firstly, the CAR based on matching firms is about twice as large as the CAR based on the market benchmark in the positive cases.

Secondly, CAR based on benchmarking is only negative between months 34 and 36. This is followed by an apparent upward trend (Figure 5.5.4).

Figure 5.5.4
CAR based on Matching Firm and S&P500

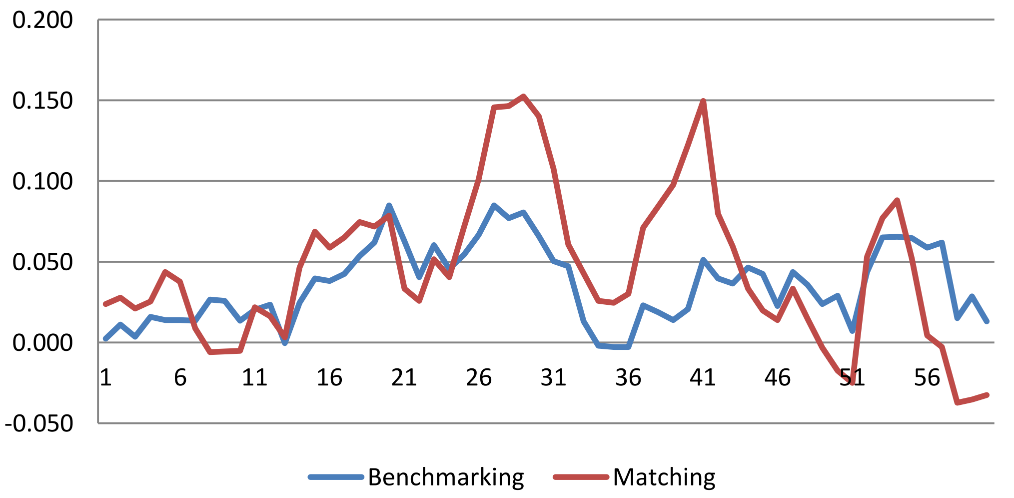


Table 5.5.5 Summary statistic for market returns (S&P500)

Month	N	Mean	t-stat	St. Dev	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.026	8.810	0.027	-0.069	0.132	-0.549	4.995	0.010	0.033
2	87	0.007	2.183	0.032	-0.092	0.070	0.051	0.333	-0.029	0.036
3	87	0.001	0.258	0.035	-0.064	0.097	-0.132	-0.921	-0.043	0.027
4	87	0.016	6.122	0.024	-0.031	0.077	0.007	0.186	0.009	0.028
5	87	0.020	7.852	0.024	-0.025	0.092	0.283	0.878	0.012	0.036
6	87	0.008	2.647	0.026	-0.048	0.054	0.124	-1.054	-0.017	0.023
7	87	0.010	2.434	0.039	-0.046	0.088	0.058	-0.883	-0.012	0.032
8	87	-0.006	-0.966	0.053	-0.146	0.061	-1.520	1.510	-0.024	0.034
9	87	0.016	3.766	0.039	-0.082	0.062	-0.315	-1.362	-0.027	0.054
10	87	0.014	3.499	0.038	-0.218	0.080	-2.402	15.396	-0.005	0.026
11	87	0.021	4.466	0.045	-0.085	0.075	-0.501	-1.055	-0.013	0.059
12	87	0.015	5.407	0.025	-0.022	0.112	0.899	1.989	0.010	0.017
13	87	0.028	9.606	0.027	-0.069	0.071	-1.441	3.024	0.024	0.041
18	87	0.016	5.375	0.029	-0.072	0.054	-0.726	-0.028	0.002	0.043
24	87	0.018	5.871	0.028	-0.060	0.112	0.680	1.983	0.010	0.017
25	87	0.023	6.738	0.031	-0.069	0.071	-1.151	1.137	0.010	0.041
26	87	0.010	2.206	0.040	-0.092	0.070	-0.245	0.184	-0.020	0.036
27	87	0.015	3.205	0.043	-0.064	0.097	-0.110	-0.583	-0.022	0.050
28	87	0.022	7.145	0.029	-0.061	0.081	-0.186	0.224	0.009	0.038
29	87	0.013	4.073	0.031	-0.025	0.092	0.250	-1.052	-0.019	0.036
30	87	0.019	6.666	0.027	-0.072	0.054	-0.837	0.392	0.002	0.039
31	87	0.003	0.548	0.043	-0.079	0.088	0.573	-0.800	-0.032	0.032
32	87	-0.029	-4.131	0.066	-0.146	0.061	-0.700	-0.711	-0.057	0.019
33	87	0.021	3.964	0.048	-0.110	0.062	-0.940	-0.524	-0.027	0.054
34	87	0.023	5.489	0.039	-0.034	0.086	0.163	-1.123	-0.005	0.063
35	87	0.035	7.383	0.044	-0.080	0.075	-1.570	1.542	0.019	0.060
36	87	0.019	5.819	0.031	-0.060	0.112	0.180	-0.155	0.004	0.056
37	87	0.023	6.415	0.034	-0.069	0.061	-1.074	0.473	0.010	0.041
42	87	0.022	6.101	0.033	-0.072	0.054	-1.265	1.074	0.002	0.043
48	87	0.022	6.048	0.033	-0.060	0.112	-0.329	0.171	0.006	0.056
49	87	0.009	2.309	0.037	-0.051	0.061	-0.407	-1.082	-0.018	0.041
50	87	-0.004	-0.727	0.046	-0.092	0.070	0.158	-0.272	-0.030	0.010
51	87	0.025	4.629	0.051	-0.064	0.097	-0.339	-0.876	-0.018	0.050
52	87	0.015	3.349	0.042	-0.061	0.081	-0.136	-0.958	-0.031	0.048
53	87	0.000	0.103	0.029	-0.025	0.059	1.025	-0.435	-0.022	0.018
54	87	0.017	4.282	0.037	-0.072	0.054	-1.205	0.565	0.002	0.043
55	87	-0.008	-1.803	0.040	-0.079	0.078	0.724	0.545	-0.032	-0.011
56	87	-0.028	-3.644	0.071	-0.146	0.061	-0.530	-0.889	-0.064	0.019
57	87	-0.010	-1.659	0.059	-0.110	0.062	-0.048	-1.345	-0.053	0.053
58	87	0.033	7.478	0.042	-0.034	0.086	-0.181	-1.404	-0.005	0.080
59	87	0.020	3.468	0.054	-0.080	0.075	-1.003	-0.463	0.007	0.059
60	87	0.022	5.637	0.036	-0.060	0.112	-0.558	0.221	0.004	0.056

Table 5.5.6 Market benchmark based abnormal return

Month	N	Mean	t-stat	St. Dev	Min	Max	Skewness	Kurtosis	25^{th} Perc.	75^{th} Perc.
1	87	0.003	0.222	0.106	-0.276	0.366	0.356	1.531	-0.052	0.058
2	87	0.009	1.000	0.081	-0.131	0.374	1.858	5.855	-0.037	0.029
3	87	-0.008	-0.872	0.082	-0.292	0.293	0.165	2.536	-0.050	0.035
4	87	0.012	1.343	0.086	-0.270	0.225	0.343	1.038	-0.042	0.056
5	87	-0.002	-0.294	0.065	-0.158	0.255	0.928	3.072	-0.035	0.026
6	87	0.000	0.015	0.074	-0.157	0.186	0.343	0.150	-0.045	0.042
7	87	0.000	-0.035	0.098	-0.182	0.306	0.494	1.003	-0.056	0.055
8	87	0.013	1.198	0.100	-0.323	0.324	0.207	2.155	-0.037	0.056
9	87	-0.001	-0.086	0.080	-0.199	0.183	-0.323	0.192	-0.055	0.048
10	87	-0.012	-1.357	0.084	-0.226	0.269	-0.085	0.895	-0.055	0.043
11	87	0.007	0.747	0.086	-0.255	0.259	0.107	1.254	-0.035	0.048
12	87	0.003	0.352	0.085	-0.246	0.242	-0.175	0.947	-0.041	0.058
13	87	-0.024	-2.312	0.097	-0.276	0.438	0.915	5.199	-0.085	0.030
18	87	0.011	0.988	0.103	-0.313	0.429	0.832	3.849	-0.040	0.053
24	87	-0.015	-1.395	0.099	-0.303	0.242	-0.244	0.158	-0.080	0.049
25	87	0.009	0.439	0.187	-0.554	1.251	3.507	23.579	-0.050	0.043
26	87	0.012	1.173	0.098	-0.276	0.423	0.690	3.402	-0.037	0.061
27	87	0.018	1.052	0.161	-0.504	0.926	2.237	13.271	-0.045	0.051
28	87	-0.008	-0.594	0.126	-0.282	0.617	1.461	6.553	-0.074	0.059
29	87	0.004	0.380	0.090	-0.258	0.328	0.540	3.362	-0.042	0.048
30	87	-0.015	-1.531	0.089	-0.297	0.259	0.038	1.378	-0.071	0.034
31	87	-0.016	-1.437	0.102	-0.276	0.318	0.413	2.032	-0.069	0.031
32	87	-0.003	-0.326	0.094	-0.288	0.323	-0.067	1.898	-0.049	0.051
33	87	-0.034	-3.137	0.101	-0.419	0.174	-1.099	3.330	-0.079	0.030
34	87	-0.015	-1.354	0.102	-0.397	0.201	-0.505	1.479	-0.073	0.048
35	87	-0.001	-0.071	0.116	-0.407	0.436	0.323	4.137	-0.068	0.046
36	87	0.000	-0.020	0.112	-0.375	0.375	-0.045	1.683	-0.056	0.062
37	87	0.026	1.374	0.177	-0.336	0.933	2.242	9.183	-0.046	0.063
42	86	-0.006	-0.356	0.153	-0.495	0.634	0.629	3.805	-0.075	0.050
48	85	-0.008	-0.581	0.128	-0.314	0.387	0.195	1.161	-0.070	0.054
49	85	-0.012	-1.139	0.097	-0.274	0.340	0.978	2.955	-0.065	0.016
50	85	0.005	0.353	0.134	-0.372	0.450	0.875	2.491	-0.079	0.063
51	85	-0.022	-1.806	0.112	-0.396	0.271	-0.503	0.962	-0.094	0.048
52	85	0.037	2.833	0.120	-0.328	0.399	0.406	1.003	-0.037	0.075
53	85	0.021	1.763	0.111	-0.235	0.594	1.648	7.204	-0.057	0.081
54	85	0.001	0.049	0.121	-0.380	0.359	0.437	1.161	-0.070	0.072
55	84	-0.012	-0.859	0.130	-0.565	0.293	-1.462	5.792	-0.070	0.054
56	84	-0.006	-0.431	0.128	-0.482	0.261	-1.003	3.953	-0.055	0.057
57	84	0.003	0.329	0.091	-0.290	0.278	0.010	0.834	-0.053	0.064
58	83	-0.041	-2.509	0.150	-0.829	0.272	-1.724	8.354	-0.113	0.041
59	82	0.008	0.488	0.148	-0.342	0.825	2.024	10.768	-0.063	0.053
60	82	-0.016	-1.170	0.121	-0.368	0.418	0.575	2.300	-0.080	0.026

Table 5.5.7 Market benchmark based cumulative abnormal return

Month	N	Mean	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.003	0.222	0.106	-0.276	0.366	0.356	1.531	-0.052	0.058
2	87	0.011	0.852	0.122	-0.265	0.469	0.885	2.127	-0.064	0.072
3	87	0.003	0.219	0.149	-0.405	0.539	0.545	2.396	-0.093	0.081
4	87	0.016	0.871	0.171	-0.538	0.633	0.584	3.135	-0.081	0.094
5	87	0.014	0.664	0.195	-0.610	0.888	0.698	4.973	-0.083	0.123
6	87	0.014	0.663	0.197	-0.576	0.923	1.015	5.989	-0.077	0.102
7	87	0.014	0.580	0.219	-0.667	0.905	1.214	5.324	-0.097	0.119
8	87	0.026	0.984	0.251	-0.545	0.883	0.807	2.016	-0.131	0.168
9	87	0.026	0.993	0.241	-0.381	0.891	1.160	2.549	-0.122	0.144
10	87	0.013	0.479	0.263	-0.540	0.964	1.097	2.635	-0.138	0.140
11	87	0.020	0.718	0.264	-0.422	1.105	1.323	3.711	-0.147	0.136
12	87	0.024	0.785	0.280	-0.592	1.114	0.771	2.318	-0.126	0.169
13	87	0.000	-0.014	0.318	-0.742	1.552	1.233	6.009	-0.176	0.150
14	87	0.024	0.682	0.334	-0.737	1.606	1.152	5.598	-0.138	0.170
15	87	0.040	1.059	0.348	-0.849	1.688	1.230	5.891	-0.115	0.184
16	87	0.038	1.062	0.336	-0.698	1.566	1.666	5.495	-0.143	0.149
17	87	0.043	1.128	0.352	-0.630	1.547	1.560	4.264	-0.153	0.141
18	87	0.054	1.246	0.401	-0.602	1.976	1.935	6.541	-0.163	0.158
19	87	0.062	1.324	0.436	-0.732	2.113	1.908	6.382	-0.173	0.188
20	87	0.085	1.848	0.428	-0.740	2.063	1.737	5.677	-0.150	0.220
21	87	0.063	1.332	0.439	-0.654	1.972	1.421	3.920	-0.201	0.261
22	87	0.041	0.832	0.454	-0.965	1.809	1.003	2.496	-0.248	0.269
23	87	0.060	1.217	0.463	-1.098	1.911	1.051	3.104	-0.205	0.309
24	87	0.046	0.858	0.496	-1.269	1.657	0.719	1.912	-0.270	0.321
25	87	0.054	0.979	0.519	-1.220	1.680	0.741	1.901	-0.256	0.319
26	87	0.067	1.134	0.549	-1.397	1.822	0.696	2.080	-0.243	0.319
27	87	0.085	1.253	0.633	-1.549	2.676	1.281	4.510	-0.234	0.364
28	87	0.077	1.088	0.660	-1.566	3.293	1.732	7.175	-0.267	0.372
29	87	0.081	1.145	0.657	-1.445	3.364	1.793	7.532	-0.267	0.379
30	87	0.066	0.929	0.663	-1.513	3.172	1.535	5.988	-0.280	0.361
31	87	0.050	0.722	0.651	-1.543	2.912	1.456	5.323	-0.286	0.293
32	87	0.047	0.661	0.664	-1.531	3.235	1.488	6.305	-0.323	0.299
33	87	0.013	0.175	0.696	-1.892	3.373	1.347	6.595	-0.325	0.270
34	87	**-0.002**	-0.024	0.698	-2.289	3.123	0.880	5.305	-0.356	0.307
35	87	**-0.003**	-0.035	0.714	-2.612	3.262	0.626	6.095	-0.372	0.309
36	87	**-0.003**	-0.037	0.736	-2.423	3.300	0.800	5.023	-0.421	0.296
37	87	0.023	0.296	0.730	-1.490	3.277	1.407	4.560	-0.455	0.322
38	87	0.019	0.244	0.717	-1.642	2.958	1.123	3.300	-0.420	0.345
39	87	0.014	0.178	0.739	-1.726	2.979	0.994	3.021	-0.436	0.306
40	87	0.020	0.252	0.757	-1.796	3.062	1.336	3.738	-0.457	0.215
41	87	0.051	0.643	0.746	-1.608	3.082	1.305	3.550	-0.399	0.286
42	86	0.040	0.451	0.820	-2.102	3.263	1.243	3.686	-0.377	0.248
43	86	0.036	0.392	0.860	-2.476	3.126	1.109	3.625	-0.386	0.270
44	86	0.046	0.487	0.882	-2.441	3.434	1.126	3.882	-0.396	0.310
45	86	0.042	0.426	0.924	-2.716	3.794	0.975	4.307	-0.386	0.322
46	85	0.023	0.215	0.978	-2.872	3.575	0.941	3.907	-0.452	0.370
47	85	0.044	0.404	0.997	-2.707	3.744	1.182	3.816	-0.531	0.333
48	85	0.036	0.322	1.020	-2.359	3.972	1.188	3.480	-0.505	0.370
49	85	0.024	0.218	1.002	-2.040	3.953	1.390	3.665	-0.585	0.333
50	85	0.029	0.262	1.013	-2.068	3.804	1.295	3.024	-0.598	0.347
51	85	0.007	0.063	1.014	-2.278	3.407	1.146	2.415	-0.627	0.319
52	85	0.044	0.398	1.012	-2.350	3.688	1.147	2.863	-0.637	0.415
53	85	0.065	0.610	0.982	-2.207	3.689	1.294	2.955	-0.603	0.420
54	85	0.066	0.603	1.004	-2.135	3.794	1.207	2.439	-0.608	0.532
55	84	0.065	0.577	1.028	-2.361	3.699	0.985	1.989	-0.531	0.544
56	84	0.059	0.521	1.032	-2.833	3.497	0.657	1.688	-0.563	0.600
57	84	0.062	0.544	1.044	-2.712	3.600	0.703	1.587	-0.563	0.543
58	83	0.015	0.125	1.087	-3.542	3.824	0.432	2.448	-0.614	0.544
59	82	0.028	0.238	1.083	-2.717	4.074	0.722	2.495	-0.524	0.551
60	82	0.013	0.108	1.083	-2.920	4.003	0.598	2.310	-0.571	0.570

5.6. Buy and Hold Return Results

In this section we will discuss the Buy and Hold Return (BH) approach as an optimal technique to test events. Table 5.6.1 shows the result for the BH of adopter firms. As expected the BH of the EVA adopter is both highly skewed and leptokurtic and the matching firms are alike. The BH of both adopter and matching firms rapidly grows after the adoption date. The adopting firms show a remarkable enhancement in performance in year 10 where the BH was not less than one per cent in the worst circumstances. There needs to be concern and caution when interpreting such an increase because this profitability enhancement might be attributed to the whole market and not only for the adoption firms. Furthermore, the return mean is positive and significant for both the event set and matching set. The BH begins to increase in month 30 where it reaches 106.3% and 92.1% for adopter and matching firms respectively. In comparison, the adopter firms mean return grows faster than the matching firms. On the other hand, the benchmarking (S&P500) copies the adopter firms in growing return but skewness and kurtosis appear to a lesser extent. Adopter firms returns are more skewed and leptokurtic.

Our first results regarding the BHAR, presented in Table 5.6.3, show the BHAR derived from an EVA adopter firm. The BHAR increases from an insignificant +1.0% after 9 months to a significant 36.4% after 27 months, becoming insignificant thereafter and continuing to increase to 37.4% after 41 months, 40.2% after 45 months, and then starts to decline to reach the lowest return of 4.3% after 59 months. All returns are skewed and leptokurtic. It is worth noting that the adopter's buy and hold return (BHAR) itself is highly skewed and leptokurtic throughout the period and that the matching firm is also skewed and leptokurtic, but to a lesser extent. Table 5.6.5 presents the results from a comparison with the benchmarking portfolio (S&P500). Generally, the BHARs are smaller in value than those obtained with matching firms' benchmarks (As seen in figure 5.6.2). Once again the BHAR has a positive and insignificant mean return through the hold period, it is positive at month one (3%), rising to the highest and insignificant mean return of 20.6% after 29 months, three years and one month after the event date. Beyond 29 months the rate of decline accelerates, with abnormal returns reaching 18.4% after 4 years and -2.7% after 5 years. The skewness and kurtosis of the BHAR based on matching firms is greater than under the benchmark S&P500. The difference being attributable to the new issue and rebalancing issue in the benchmark portfolio compared to the matching firm benchmark.

Table 5.6.1 Summary Statistic for BH: EVA adopter BH returns

Month	N	Mean	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.028	2.549	0.103	-0.266	0.376	0.347	1.679	-0.031	0.085
2	87	0.043	3.186	0.126	-0.182	0.615	1.390	4.499	-0.053	0.102
3	87	0.037	2.087	0.164	-0.336	0.808	1.611	6.259	-0.057	0.112
4	87	0.066	3.110	0.197	-0.333	0.912	1.870	6.594	-0.046	0.163
5	87	0.088	3.555	0.230	-0.378	1.352	2.116	10.178	-0.051	0.193
6	87	0.096	3.490	0.256	-0.327	1.560	2.625	12.744	-0.046	0.186
7	87	0.105	3.488	0.282	-0.382	1.536	2.198	8.461	-0.054	0.191
8	87	0.111	3.573	0.291	-0.469	1.108	1.104	2.413	-0.065	0.239
9	87	0.124	3.860	0.299	-0.438	1.258	1.351	3.205	-0.086	0.260
10	87	0.130	3.610	0.335	-0.500	1.603	1.724	5.188	-0.097	0.254
11	87	0.160	4.010	0.373	-0.391	2.125	2.320	9.259	-0.063	0.291
12	87	0.183	4.297	0.398	-0.491	2.329	2.173	9.092	-0.065	0.344
13	87	0.196	3.573	0.511	-0.509	3.922	4.603	32.534	-0.061	0.349
18	87	0.371	4.269	0.810	-0.422	6.322	5.139	34.688	0.014	0.501
24	87	0.461	5.285	0.814	-0.636	4.451	2.531	8.220	-0.005	0.530
25	87	0.498	5.305	0.875	-0.637	4.353	2.631	8.206	0.009	0.616
26	87	0.540	5.315	0.948	-0.708	4.925	2.818	9.613	0.044	0.682
27	87	0.675	4.090	1.540	-0.725	10.147	4.436	22.867	0.059	0.681
28	87	0.749	3.355	2.082	-0.738	17.176	6.343	46.911	0.074	0.732
29	87	0.775	3.307	2.187	-0.752	18.886	6.965	56.093	0.112	0.819
30	87	0.749	3.773	1.851	-0.763	15.118	5.952	43.263	0.072	0.835
31	87	0.679	4.297	1.475	-0.774	10.176	4.339	23.159	0.080	0.827
32	87	0.639	3.493	1.705	-0.744	14.000	6.078	45.044	0.035	0.732
33	87	0.660	3.101	1.985	-0.865	16.882	6.728	53.215	-0.004	0.764
34	87	0.619	3.652	1.582	-0.919	12.882	5.784	42.574	-0.045	0.751
35	87	0.682	3.485	1.826	-0.952	15.824	6.859	56.049	0.016	0.843
36	87	0.729	3.583	1.899	-0.943	16.118	6.461	50.980	0.008	0.922
37	87	0.787	3.687	1.992	-0.887	16.765	6.326	48.976	-0.002	0.936
42	86	0.915	4.119	2.060	-0.958	17.000	5.937	44.375	0.003	1.097
48	85	1.095	4.857	2.079	-0.980	12.118	3.031	11.674	-0.092	1.328
49	85	1.079	4.543	2.189	-0.974	14.412	3.654	17.713	-0.109	1.292
50	85	1.114	4.441	2.312	-0.976	16.177	3.920	21.454	-0.141	1.280
51	85	1.096	4.540	2.227	-0.980	15.471	3.805	20.627	-0.156	1.368
52	85	1.166	4.868	2.208	-0.980	15.294	3.691	19.723	-0.115	1.496
53	85	1.152	5.147	2.063	-0.980	13.353	3.160	14.381	-0.118	1.371
54	85	1.175	5.664	1.913	-0.980	8.471	1.994	4.148	-0.117	1.490
55	84	1.171	5.685	1.888	-0.981	8.192	1.844	3.377	-0.039	1.488
56	84	1.109	5.366	1.893	-0.985	8.604	2.143	5.107	-0.047	1.487
57	84	1.114	5.419	1.885	-0.985	8.706	1.970	4.402	-0.088	1.437
58	83	1.065	5.506	1.763	-0.997	7.971	1.805	3.501	-0.046	1.657
59	82	1.074	5.772	1.684	-0.995	6.529	1.565	2.191	-0.021	1.719
60	82	1.063	5.902	1.631	-0.993	6.221	1.437	1.593	-0.008	1.647

Table 5.6.2 Summary Statistic for BH: Matching firm BH returns

Month	N	Mean	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.005	0.535	0.078	-0.302	0.260	-0.246	3.375	-0.035	0.039
2	87	0.016	0.980	0.156	-0.510	0.888	1.691	11.473	-0.068	0.071
3	87	0.013	0.748	0.167	-0.671	0.386	-1.068	3.828	-0.044	0.111
4	87	0.041	1.796	0.211	-0.648	0.605	-0.362	1.706	-0.040	0.148
5	87	0.036	1.532	0.222	-0.607	0.683	-0.115	1.641	-0.051	0.159
6	87	0.046	1.944	0.221	-0.638	0.606	-0.150	1.135	-0.058	0.159
7	87	0.088	3.194	0.256	-0.673	0.753	-0.103	1.268	-0.011	0.219
8	87	0.097	3.626	0.248	-0.476	0.903	0.509	1.352	-0.011	0.238
9	87	0.113	4.007	0.263	-0.539	0.898	0.409	1.102	0.000	0.259
10	87	0.115	3.846	0.280	-0.584	1.019	0.406	1.120	0.000	0.258
11	87	0.116	3.782	0.286	-0.593	0.790	0.058	0.208	-0.014	0.249
12	87	0.148	4.267	0.323	-0.710	0.943	0.128	0.334	0.000	0.327
13	87	0.165	4.563	0.337	-0.661	1.255	0.317	0.744	0.000	0.354
18	87	0.231	4.931	0.436	-0.839	1.563	0.621	1.004	0.000	0.426
24	87	0.337	5.906	0.533	-0.742	1.976	0.693	0.644	0.000	0.596
25	87	0.337	5.775	0.545	-0.742	2.348	0.854	1.546	0.000	0.638
26	87	0.329	5.338	0.575	-0.742	3.000	1.296	4.377	0.000	0.642
27	87	0.311	4.946	0.587	-0.742	3.019	1.359	4.378	0.000	0.580
28	87	0.336	4.938	0.634	-0.742	2.952	1.334	3.094	0.000	0.635
29	87	0.351	4.994	0.655	-0.780	2.874	1.235	2.535	-0.004	0.653
30	87	0.376	5.216	0.673	-0.796	2.758	1.031	1.447	0.000	0.733
31	87	0.424	5.204	0.761	-0.845	3.082	1.136	1.425	-0.023	0.843
32	87	0.435	5.200	0.781	-0.832	3.107	1.170	1.283	0.000	0.757
33	87	0.449	5.105	0.820	-0.814	3.205	1.217	1.515	-0.050	0.832
34	87	0.465	5.156	0.841	-0.838	3.684	1.303	1.902	-0.049	0.812
35	87	0.516	5.347	0.900	-0.842	3.909	1.475	2.662	-0.025	0.999
36	87	0.510	5.574	0.853	-0.788	3.798	1.349	2.206	-0.030	1.032
37	87	0.515	5.738	0.837	-0.793	3.190	1.090	1.060	-0.037	1.139
42	87	0.561	5.790	0.903	-0.780	4.504	1.442	3.389	0.000	1.202
49	87	0.781	4.433	1.642	-0.742	12.989	5.077	35.541	0.000	1.221
50	87	0.816	4.277	1.780	-0.742	13.954	5.135	35.109	0.000	1.087
51	87	0.813	4.325	1.753	-0.742	13.600	5.011	33.571	0.000	1.044
52	87	0.793	3.944	1.876	-0.848	14.873	5.381	37.600	0.000	1.135
53	87	0.765	4.063	1.757	-0.848	14.056	5.320	38.137	0.000	1.038
54	87	0.787	3.719	1.973	-0.848	16.587	6.206	48.424	-0.026	1.060
55	86	0.871	3.378	2.392	-0.760	20.709	6.916	56.699	0.000	1.045
56	86	0.942	2.956	2.956	-0.742	26.357	7.675	65.914	0.000	1.080
57	86	0.886	3.171	2.590	-0.742	22.647	7.202	59.930	0.000	0.962
58	86	0.919	3.045	2.799	-0.742	24.881	7.582	64.746	0.000	1.023
59	85	0.994	3.043	3.013	-0.742	26.733	7.621	65.063	0.000	1.299
60	85	0.921	3.751	2.263	-0.742	19.239	6.512	51.889	0.000	1.255

Table 5.6.3 Summary Statistic for BHAR Matching firms

Month	N	Mean	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.024	1.599	0.138	-0.259	0.565	1.104	3.605	-0.061	0.084
2	87	0.027	1.132	0.220	-0.973	0.921	-0.132	7.044	-0.083	0.123
3	87	0.023	0.918	0.237	-0.484	0.815	0.753	1.094	-0.129	0.140
4	87	0.025	0.872	0.270	-0.695	0.878	0.207	0.943	-0.138	0.176
5	87	0.051	1.658	0.287	-0.723	0.758	0.085	0.199	-0.159	0.226
6	87	0.050	1.599	0.291	-0.782	0.955	0.237	0.988	-0.137	0.229
7	87	0.018	0.535	0.309	-0.792	1.056	0.335	1.485	-0.144	0.141
8	87	0.015	0.427	0.324	-0.714	0.977	0.192	1.120	-0.164	0.194
9	87	**0.010**	**0.292**	0.333	-0.951	0.880	-0.153	1.033	-0.177	0.178
10	87	0.014	0.335	0.397	-1.031	1.311	0.308	2.038	-0.200	0.183
11	87	0.044	0.979	0.423	-0.976	1.950	1.098	5.016	-0.196	0.234
12	87	0.036	0.703	0.475	-1.408	2.252	0.718	5.566	-0.217	0.254
13	87	0.031	0.512	0.562	-1.405	3.510	2.356	16.800	-0.178	0.261
14	87	0.085	1.398	0.569	-1.168	3.576	2.580	15.777	-0.198	0.260
15	87	0.117	1.746	0.627	-1.403	3.969	2.668	16.099	-0.225	0.294
16	87	0.089	1.367	0.608	-1.255	3.261	1.786	8.584	-0.230	0.341
17	87	0.106	1.670	0.594	-1.414	2.775	1.048	4.907	-0.177	0.400
18	87	0.140	1.690	0.774	-1.513	4.759	2.789	15.563	-0.215	0.389
19	87	0.148	1.578	0.875	-1.489	5.404	3.344	17.974	-0.240	0.410
20	87	0.152	1.689	0.839	-1.282	5.156	3.060	16.422	-0.293	0.410
21	87	0.109	1.357	0.746	-1.328	4.013	2.059	9.584	-0.328	0.375
22	87	0.089	1.254	0.661	-1.324	2.741	1.189	4.315	-0.305	0.374
23	87	0.130	1.735	0.699	-1.599	2.758	0.808	2.349	-0.350	0.444
24	87	0.124	1.501	0.771	-1.508	2.941	1.003	2.920	-0.384	0.434
25	87	0.161	1.732	0.865	-1.958	4.353	1.614	6.448	-0.373	0.468
26	87	**0.211**	**2.006**	0.983	-2.545	4.765	1.761	7.079	-0.325	0.536
27	87	**0.364**	**2.234**	1.522	-2.552	10.147	4.066	22.522	-0.332	0.532
28	87	0.413	1.851	2.083	-2.406	17.176	6.363	49.871	-0.220	0.555
29	87	0.425	1.780	2.224	-2.458	18.886	6.859	56.352	-0.262	0.624
30	87	0.373	1.867	1.862	-1.939	15.118	6.027	46.440	-0.292	0.623
31	87	0.255	1.598	1.488	-3.243	10.176	3.760	23.568	-0.376	0.586
32	87	0.203	1.078	1.759	-2.849	14.000	5.716	44.580	-0.417	0.462
33	87	0.211	0.954	2.061	-3.188	16.973	6.345	51.760	-0.429	0.522
34	87	0.155	0.840	1.717	-2.995	13.120	4.982	38.066	-0.411	0.633
35	87	0.166	0.772	2.008	-3.865	16.068	5.757	46.431	-0.350	0.610
36	87	0.220	1.000	2.051	-4.177	16.293	5.611	44.399	-0.437	0.692
37	87	0.272	1.229	2.065	-2.611	16.750	6.014	47.760	-0.476	0.535
38	87	0.252	1.514	1.551	-2.077	11.219	4.220	28.896	-0.484	0.673
39	87	0.282	1.729	1.522	-2.416	10.955	4.136	27.962	-0.332	0.684
40	87	0.337	1.842	1.708	-2.397	12.632	4.539	31.268	-0.338	0.642
41	87	**0.374**	**1.945**	1.792	-2.284	13.734	4.971	36.013	-0.317	0.824
42	86	0.345	1.473	2.174	-3.385	17.064	5.518	41.645	-0.548	0.863
43	86	0.338	1.484	2.111	-2.332	16.008	5.065	36.029	-0.532	0.918
44	86	0.344	1.284	2.487	-2.343	20.262	6.204	49.114	-0.604	0.866
45	86	**0.402**	**1.100**	3.386	-5.507	29.135	7.274	62.522	-0.633	0.879
46	85	0.333	1.067	2.878	-10.460	21.550	4.291	37.375	-0.600	0.891
47	85	0.397	1.492	2.452	-6.465	16.618	3.643	23.407	-0.480	0.861
48	85	0.320	1.129	2.612	-13.214	12.276	0.104	13.804	-0.508	0.831
49	85	0.278	0.977	2.623	-11.486	14.516	1.347	14.872	-0.675	0.858
50	85	0.277	0.916	2.787	-12.276	16.393	1.471	17.361	-0.693	0.826
51	85	0.260	0.889	2.694	-11.867	15.793	1.397	17.202	-0.641	0.849
52	85	**0.350**	**1.154**	2.797	-13.399	15.620	0.637	16.466	-0.546	1.060
53	85	**0.362**	**1.297**	2.574	-12.380	13.708	0.425	14.558	-0.469	0.914
54	85	**0.366**	**1.313**	2.570	-15.072	8.731	-1.841	16.042	-0.641	1.062
55	84	0.277	0.891	2.844	-18.917	6.992	-3.316	24.924	-0.592	1.031
56	84	0.140	0.389	3.304	-24.639	7.792	-4.878	38.610	-0.599	0.976
57	84	0.205	0.633	2.973	-20.608	7.884	-3.793	29.151	-0.697	1.009
58	83	0.113	0.327	3.136	-22.890	6.510	-4.590	35.622	-0.726	0.969
59	82	0.043	0.120	3.273	-24.640	5.886	-5.210	40.325	-0.687	0.958
60	82	0.114	0.406	2.551	-17.096	4.834	-3.598	25.216	-0.761	1.078

Table 5.6.4 Summary Statistic for BH: Market returns

Month	N	Mean	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.026	8.810	0.027	-0.069	0.132	-0.549	4.995	0.010	0.033
2	87	0.033	7.900	0.039	-0.070	0.174	0.039	1.500	0.001	0.061
3	87	0.035	5.330	0.061	-0.121	0.205	0.071	-0.159	-0.032	0.076
4	87	0.051	7.271	0.065	-0.064	0.191	-0.052	-1.185	-0.005	0.118
5	87	0.072	9.583	0.070	-0.049	0.198	-0.067	-1.370	-0.004	0.145
6	87	0.081	8.222	0.092	-0.073	0.255	-0.144	-1.360	-0.016	0.177
7	87	0.092	7.947	0.109	-0.083	0.316	0.640	-1.043	0.017	0.224
8	87	0.084	8.061	0.097	-0.141	0.362	0.599	-0.300	0.019	0.214
9	87	0.102	7.944	0.120	-0.212	0.329	0.238	-0.641	0.002	0.265
10	87	0.116	10.300	0.105	-0.197	0.266	-0.335	-0.045	0.013	0.207
11	87	0.142	9.635	0.137	-0.137	0.318	-0.230	-1.378	0.003	0.237
12	87	0.158	10.559	0.140	-0.130	0.341	-0.203	-1.344	0.032	0.270
13	87	0.191	12.031	0.148	-0.144	0.385	-0.223	-1.380	0.052	0.319
18	87	0.286	13.937	0.191	-0.250	0.531	-0.467	-0.837	0.168	0.437
24	87	0.387	15.172	0.238	-0.334	0.659	-0.689	-0.409	0.180	0.576
25	87	0.419	15.536	0.252	-0.352	0.728	-0.545	-0.272	0.193	0.592
26	87	0.435	15.109	0.269	-0.363	0.722	-0.560	-0.461	0.180	0.704
27	87	0.458	14.959	0.286	-0.358	0.789	-0.596	-0.490	0.183	0.737
28	87	0.489	15.585	0.293	-0.306	0.805	-0.498	-0.663	0.230	0.802
29	87	0.507	16.405	0.288	-0.274	0.847	-0.531	-0.494	0.274	0.771
30	87	0.543	15.540	0.326	-0.326	0.927	-0.439	-0.707	0.282	0.841
31	87	0.549	14.693	0.348	-0.380	1.078	-0.112	-0.617	0.324	0.819
32	87	0.491	15.526	0.295	-0.377	0.958	-0.274	0.250	0.298	0.564
33	87	0.527	15.059	0.327	-0.445	1.063	-0.349	0.578	0.341	0.651
34	87	0.560	16.072	0.325	-0.397	0.991	-0.648	0.113	0.335	0.784
35	87	0.617	16.292	0.353	-0.363	1.080	-0.558	-0.355	0.389	0.889
36	87	0.652	16.021	0.379	-0.401	1.113	-0.465	-0.605	0.414	0.996
37	87	0.689	16.778	0.383	-0.418	1.134	-0.605	-0.303	0.459	1.078
42	87	0.819	15.855	0.482	-0.337	1.469	-0.468	-0.589	0.490	1.229
48	87	0.919	15.529	0.552	-0.284	1.676	-0.444	-0.564	0.628	1.385
49	87	0.936	15.691	0.557	-0.304	1.786	-0.413	-0.192	0.617	1.264
50	87	0.929	15.689	0.552	-0.316	1.696	-0.560	-0.369	0.633	1.250
51	87	0.990	14.986	0.616	-0.310	1.801	-0.438	-0.878	0.566	1.433
52	87	1.017	15.229	0.623	-0.254	1.907	-0.402	-0.698	0.632	1.383
53	87	1.007	15.955	0.588	-0.237	1.835	-0.515	-0.530	0.651	1.339
54	87	1.056	15.178	0.649	-0.224	1.989	-0.429	-0.693	0.651	1.431
55	87	1.040	15.268	0.635	-0.250	1.893	-0.611	-0.635	0.635	1.403
56	87	0.974	14.594	0.623	-0.248	1.875	-0.344	-0.728	0.530	1.464
57	87	0.959	14.410	0.621	-0.241	1.793	-0.604	-0.673	0.405	1.332
58	87	1.022	14.629	0.651	-0.231	1.968	-0.420	-0.736	0.431	1.355
59	87	1.054	15.040	0.654	-0.201	2.024	-0.345	-0.682	0.538	1.495
60	87	1.113	14.512	0.715	-0.175	2.199	-0.222	-0.768	0.550	1.635

Table 5.6.5 Summary Statistic for BHAR Using the market portfolio as a benchmark

Month	N	Mean	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	**0.003**	**0.222**	0.106	-0.276	0.366	0.356	1.531	-0.052	0.058
2	87	0.010	0.731	0.127	-0.268	0.534	1.129	3.344	-0.064	0.066
3	87	0.002	0.125	0.160	-0.384	0.673	1.114	4.430	-0.101	0.072
4	87	0.015	0.735	0.192	-0.524	0.826	1.356	5.424	-0.094	0.093
5	87	0.016	0.645	0.226	-0.576	1.293	2.057	11.638	-0.092	0.115
6	87	0.015	0.561	0.243	-0.582	1.444	2.615	14.408	-0.088	0.104
7	87	0.013	0.446	0.269	-0.672	1.381	2.314	9.919	-0.126	0.118
8	87	0.028	0.891	0.288	-0.616	1.122	1.332	3.516	-0.138	0.162
9	87	0.021	0.683	0.290	-0.486	1.210	1.682	4.889	-0.146	0.140
10	87	0.014	0.395	0.326	-0.632	1.471	1.883	5.973	-0.160	0.142
11	87	0.019	0.492	0.356	-0.590	1.926	2.488	10.560	-0.179	0.132
12	87	0.025	0.633	0.376	-0.673	2.062	2.128	9.543	-0.177	0.156
13	87	0.005	0.092	0.497	-0.803	3.603	4.492	31.865	-0.228	0.149
14	87	0.034	0.608	0.528	-0.800	3.754	4.198	28.362	-0.206	0.179
15	87	0.058	0.906	0.594	-0.817	4.315	4.513	30.711	-0.186	0.172
16	87	0.043	0.704	0.566	-0.772	3.790	3.898	22.625	-0.213	0.131
17	87	0.049	0.791	0.579	-0.786	3.594	3.308	16.569	-0.221	0.134
18	87	0.085	0.979	0.810	-0.777	5.908	4.886	31.881	-0.283	0.145
19	87	0.115	1.135	0.941	-0.830	6.726	4.852	30.183	-0.282	0.164
20	87	0.140	1.476	0.887	-0.850	6.273	4.597	27.909	-0.240	0.263
21	87	0.101	1.150	0.819	-0.838	5.404	3.818	20.848	-0.311	0.223
22	87	0.065	0.787	0.776	-0.941	4.643	3.053	14.250	-0.357	0.305
23	87	0.089	0.987	0.845	-1.021	5.348	3.409	17.634	-0.330	0.349
24	87	0.074	0.828	0.834	-1.150	3.937	2.246	7.192	-0.409	0.300
25	87	0.078	0.810	0.901	-1.074	3.989	2.432	7.661	-0.443	0.293
26	87	0.105	1.012	0.973	-1.116	4.517	2.665	9.128	-0.410	0.296
27	87	0.217	1.300	1.560	-1.269	9.763	4.284	21.934	-0.440	0.319
28	87	0.260	1.150	2.105	-1.235	16.774	6.230	45.791	-0.516	0.329
29	87	**0.268**	**1.133**	2.208	-1.216	18.452	6.854	54.763	-0.570	0.381
30	87	0.206	1.023	1.882	-1.262	14.680	5.815	41.726	-0.615	0.330
31	87	0.130	0.805	1.512	-1.248	9.805	4.294	22.717	-0.619	0.265
32	87	0.147	0.793	1.729	-1.308	13.602	5.933	43.666	-0.591	0.304
33	87	0.133	0.618	1.999	-1.346	16.409	6.644	52.354	-0.689	0.291
34	87	0.059	0.345	1.605	-1.392	12.370	5.588	40.718	-0.667	0.279
35	87	0.065	0.332	1.837	-1.307	15.201	6.706	54.465	-0.697	0.305
36	87	0.078	0.378	1.921	-1.448	15.530	6.293	49.386	-0.773	0.280
37	87	0.098	0.454	2.016	-1.363	16.079	6.110	46.626	-0.809	0.241
38	87	0.024	0.149	1.502	-1.388	10.511	4.405	27.646	-0.739	0.238
39	87	0.011	0.065	1.517	-1.584	10.318	4.127	24.846	-0.742	0.233
40	87	0.027	0.147	1.690	-1.534	11.907	4.570	28.741	-0.795	0.187
41	87	0.071	0.378	1.742	-1.537	12.887	5.010	34.272	-0.806	0.239
42	86	0.097	0.426	2.107	-1.858	16.102	5.535	39.715	-0.738	0.228
43	86	0.101	0.460	2.035	-1.863	14.888	4.987	33.265	-0.804	0.277
44	86	0.172	0.666	2.399	-1.758	19.248	6.199	47.755	-0.707	0.336
45	86	0.261	0.752	3.220	-1.853	27.910	7.640	65.559	-0.706	0.328
46	85	0.184	0.658	2.581	-1.892	20.392	6.005	45.316	-0.797	0.400
47	85	0.206	0.816	2.325	-1.930	15.422	4.117	22.589	-0.891	0.401
48	85	0.180	0.760	2.184	-2.228	11.037	2.923	10.436	-0.937	0.428
49	85	0.146	0.591	2.280	-2.315	13.310	3.414	15.167	-0.989	0.345
50	85	0.193	0.752	2.362	-2.237	14.927	3.635	18.299	-1.014	0.262
51	85	0.115	0.466	2.279	-2.342	14.109	3.447	17.085	-0.983	0.376
52	85	0.157	0.643	2.256	-2.353	13.911	3.383	16.504	-1.066	0.258
53	85	0.153	0.669	2.113	-2.176	12.014	2.916	11.929	-1.065	0.253
54	85	0.128	0.595	1.978	-2.173	7.040	1.851	3.273	-1.068	0.291
55	84	0.144	0.679	1.941	-2.083	6.869	1.682	2.459	-1.100	0.346
56	84	0.142	0.683	1.906	-2.053	7.140	1.845	3.566	-0.981	0.419
57	84	0.165	0.799	1.896	-2.029	7.373	1.777	3.349	-1.007	0.601
58	83	0.051	0.259	1.809	-2.376	6.871	1.639	2.767	-1.010	0.369
59	82	0.041	0.206	1.785	-2.415	6.535	1.639	2.745	-1.013	0.441
60	82	**-0.027**	**-0.143**	1.736	-2.492	5.608	1.361	1.634	-1.124	0.395

Clearly, as Figures 5.6.3 and 5.6.4 depict, there is a quite obvious difference between BHAR and CAR. CARs look more stable than BHAR when using matching firms to calculate the abnormality. On the other hand, the results based on the market benchmark are essentially the same and the produced curves are identical in most time periods. Even within BHAR itself. BHAR calculated using a matching firm appears greater than when using the benchmark market portfolio (S&P500) (Figure 5.6.4). Overall, the behaviour of the aggregate abnormal return, CAR and BHAR, clearly appear to be sensitive to the method adopted to gauge the abnormality. Furthermore, BHAR based on matching firms grow faster than when based on the S&P500 benchmark especially after the adoption date where BHAR increased by more than 1.5 times.

Figure 5.6.2: BHAR, CAR Distribution Using Matching Firms

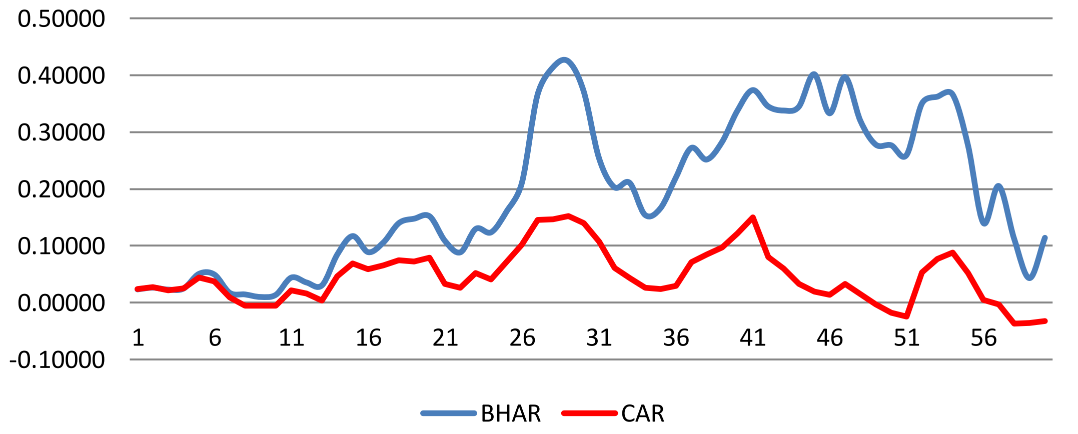
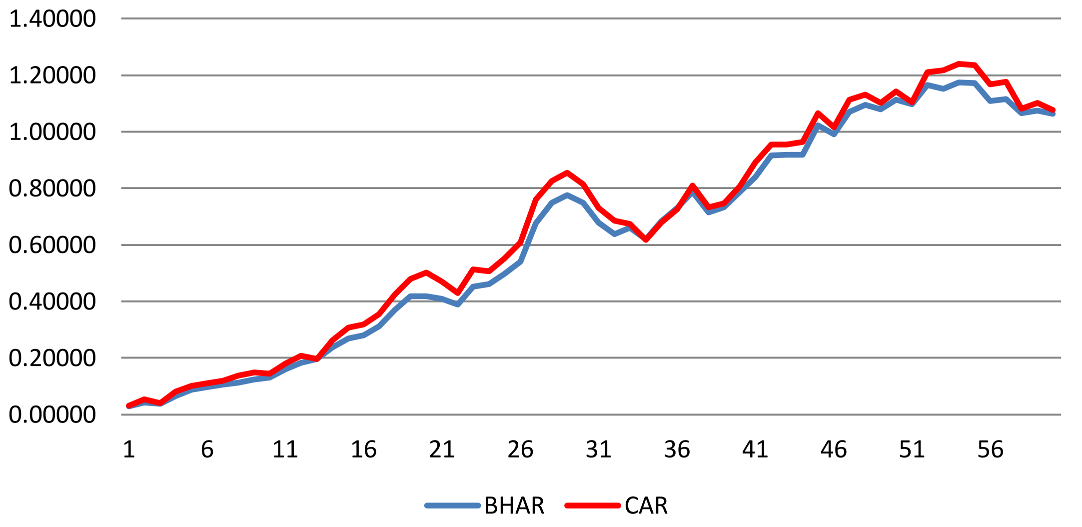
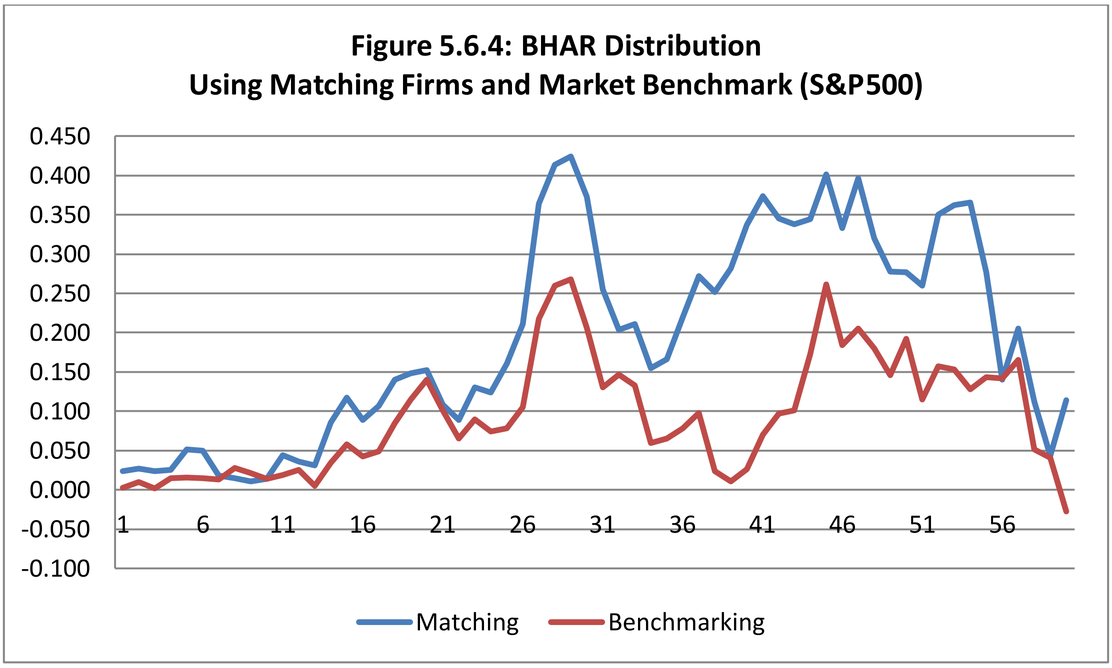


Figure 5.6.3: BHAR, CAR Distribution Using Benchmark market (S&P500)



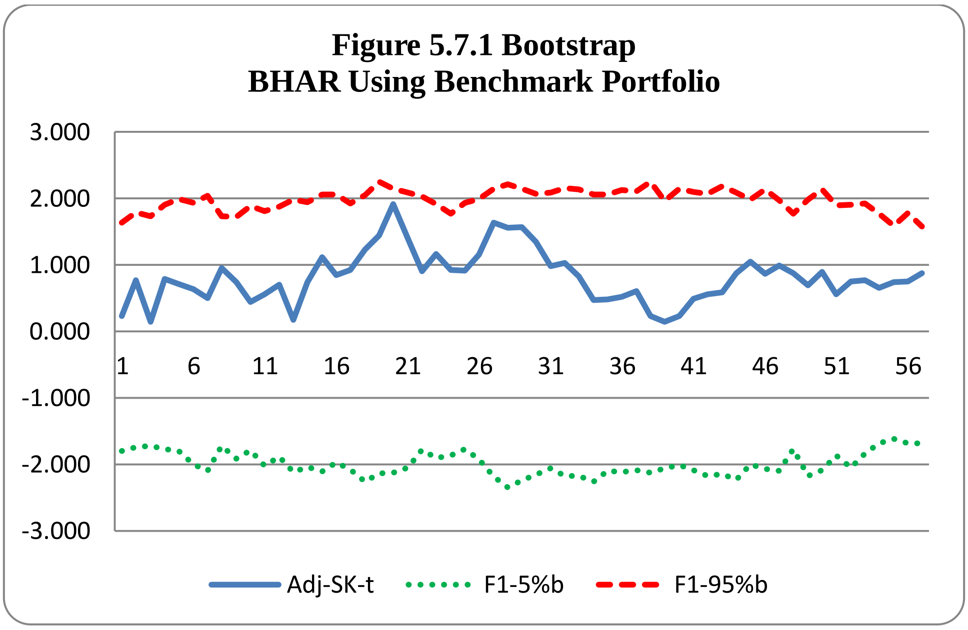


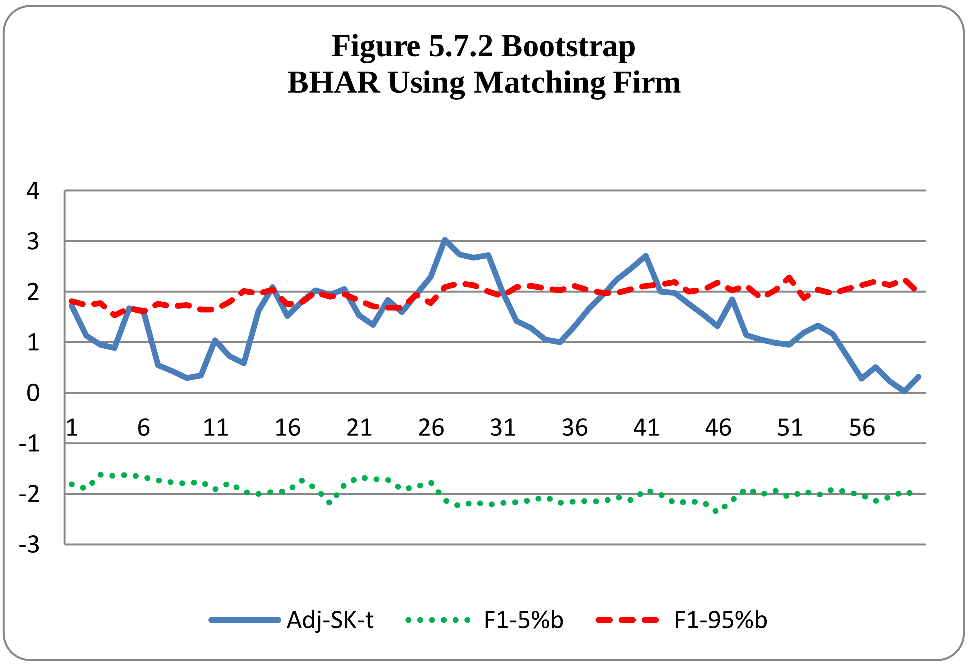
5.7 Testing the Aggregate Abnormal Returns

As discussed in the previous section the aggregate abnormal return, BHAR and CAR, is always highly skewed and leptokurtic and we suggest the wild bootstrapping (as discussed in methodology section) as a correction for these biases. This section will highlight the results of the bootstrap and the result of testing the null hypothesis that the aggregate abnormal returns, CAR and BHAR, are zero. The full version of the bootstrap test and tables are provided in Appendix (3). As the tables in the appendix show, in the vast majority of cases, the CARs are not significant. However, the results show that in two or three months the CAR appear to be significant (that is, the adopters have higher abnormal returns or the non-adopters have higher performance). Given that these are two or three out of sixty months, they represent the 5% tolerance and might be due to data mining (out of 60 tests, we usually expect 5% of these tests to be significant by chance alone).

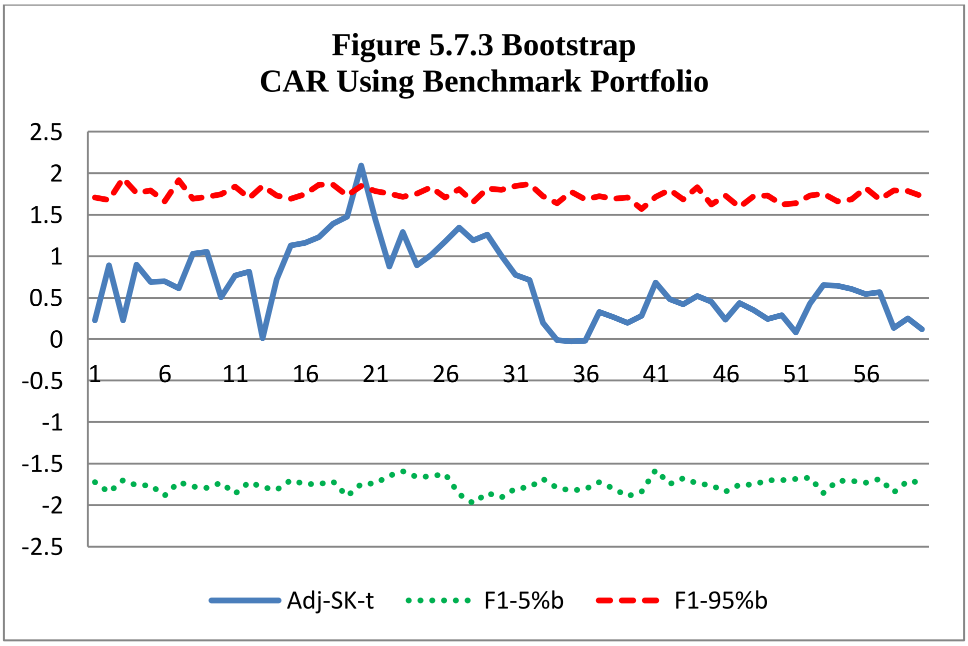
The graph below depicts the skewness-adjusted *t*-statistic for the holding periods (60 months). The dotted and dashed lines are the 5th and 95th percentiles of the bootstrapped distribution. These can be interpreted at either the 5% critical value level for a one tail test, or the 10% critical value for a two tail test. The graphs below describe the two schemes of benchmarking: S&P500 portfolio and matching firms have a similar pattern but express different messages. The four graphs have the same feature which is that outperformance increases at around month 13 but there is then a slight variation with a different and insignificant range. For the BHAR-based market benchmark portfolio scheme the insignificancy remains hold throughout the holding period and the outperformance accelerates to reach the highest volume in month 20. Following this it is slightly volatile and reaches the lowest point of outperformance in month 39 after which it dramatically increases until month 45 where it then appears stable to the end of the holding period. Similarly, the BHAR based on matching firms copies its counterpart but the outperformance ceases from being significant at around the 25 – 31 month and 37-42 month period. However, the aggregate BH return rapidly decreases after month 47 to reach close to zero as shown in Figure 5.7.2.

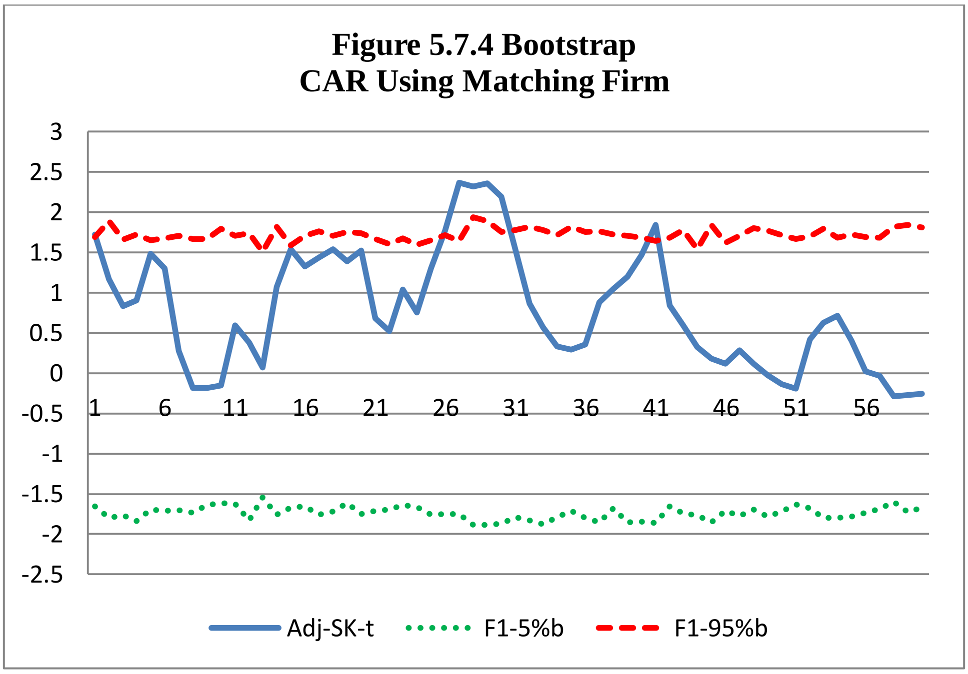
In general, the results over the short term are relatively weak, especially for the first 12 months. This could be due to the possibility that EVA adoption takes time to reveal its effect. Alternatively, the changes that managers undertake following EVA adoption may be strategic with an effect that can only be observed over the long term.





The CAR based on the matching benchmark provides a different story: the graph in Figure 5.7.4 shows that CAR behaviour becomes more erratic and is no longer significant beginning from around the period 25-31 months. The performance of the adopting firms is quite low, almost zero after the adoption date and sometimes underperforms the matching firms as depicted in Figure 5.7.4.





In general, the purpose of the current chapter is to investigate whether the adoption of EVA as a compensation and management plan will positively affect the performance of adopting companies. I compared the performance of adopting firms to that of selected matching firms and to the market index particularly the S&P500 portfolio. Then I used the two common aggregating methods to test the event of adopting EVA by different US firms namely the CAR and BHAR methods. The results obtained however, showed a slight improvement in the performance of companies adopting EVA within ten years from the date of adoption. This is implicitly in line with what Wallace (1997) concludes in this regard. Wallace indicated that adopting EVA will encourage managers to take decisions that will lead to efficiently using the firm's assets to increase the wealth of shareholders and the value of firms through taking accurate decisions regarding the investing, financing and operating activities. This, in turn, will be reflected in the price of shares in the stock market, therefore improving the performances of these stocks. Nevertheless, I replicated the work of Wallace (1997) in chapter 6 and the result was inconsistent to some extent.

Similarly, the results achieved is incompatible with that of Kleiman (1999) where he compares the performance of firms adopting EVA to the performance two set of matching firms, the industry peer and closest match peer. By comparing the median of abnormal return he found that EVA adopter's show better performance after the adoption and outperform both the industry peer and closest peer match firms. The adjusted market return increases from 2.8% to 28.8% through three year time period after the adoption for the industry peer and from 2.6% to 7.8% for the closest match peer. However, the increases in performance of the adopting firms are still quite low. the current research used the mean of CAR and BHAR to compare the performances of adopting firms to those matching firms and market benchmark portfolio (S&P500 index) and the result revealed that EVA's firms outperform those matching and S&P500 portfolio and the CAR increases to reach 8.85% and 36.6% for matching firms and benchmark index respectively and the BHAR increases to 6.6% and 26.8% for the same order.

Contrary to Wallace's and my findings, Tortella and Brusco (2003) used 65 EVA adopter firms to analyse the market reaction to EVA adoption. They compared the daily abnormal return of adopting firms to that of the equally weighted index (EW) and value weighted index (VW) to test for any changes in performances after the adoption date. However, he used a window of 30 days prior to the adoption and 100 days post the adoption. For both the equally weighted and value weighted index the results indicated that the daily cumulative average abnormal return (CAAR) is insignificant and negative for 14 days after the adoption date. Furthermore, they conclude that the market does not react properly to the evolution of EVA as a performance measure. In my opinion, because the process of adoption of EVA as a performance and management tool is of a long-term nature, it takes some years to complete the process, the daily stock price fails to reflect this information and the daily CAAR appear insignificant for much of the time.

5.8 Conclusion

This chapter has described the research design and the methodology that was used to examine the EVA adoption event. Both the CAR and the BHAR approaches were adopted to conduct our study. The previous research has been extended by increasing the number of EVA adopter firms to 89 and the time horizon of the study to cover the firms' performance during the period 1960-2012 was also extended. In addition wild bootstrapping and using the skewness adjusted t-statistic to enhance the statistical reliability of the event test statistics was adopted. By doing this all three moments of the parent distribution of the test statistic (Heteroscedasticity, skewness and kurtosis) were taken into account. Furthermore, the criterion to select the matching firms was carefully applied as was the problem of delisting.

The results obtained in this chapter are consistent with the previous studies' results discussed in section 5.2. Regardless of the methodology approach , CAR or BHAR, the results of this chapter reveal that firms adopting EVA as a compensation plan and management tool outperform the market (S&P500) and matching firms (same sector) most of the time within holding period. The CAR results show that despite the benchmarking used the majority of adopter firms positively outperform the matching firms and the S&P500 portfolio and for a few months the adopter firms have a negative performance mainly in year one and year five of the 10 year estimated period. In general, CAR appears more stable and less skewed and leptokurtic.

Regarding the BHAR approach the findings reveal that the mean return of the adopter firms is both positive and highly skewed and leptokurtic throughout the holding period. Generally, the results obtained from a comparison against the benchmarking portfolio (S&P500) are smaller in value than those obtained when compared to the matching firms' benchmark. One interesting finding is that CAR is almost the same as BHAR when the S&P500 portfolio is used as a benchmark to calculate the aggregate returns.

To sum up, irrespective of the aggregation approach used to measure the abnormal return, the adopter firms have a considerably low outperformance and this outperformance increased as the hold period increased. However, even with the positive performances most EVA adopter firms' outperformance declines after the adoption and takes some time to return to negative performance when matching benchmarks are used. This might typically reflect the fact that the market might react poorly to the adoption announcement. Finally, by analysing the adopter firms' performance we recognize that the adoption exists after a period of bad performances.

Chapter 6

The Long-Term Effect of Economic Value Added Adoption on the Firm's Business Decision

6.1 Introduction

The economic value added (EVA) metric has received considerable attention in the literature as the best performance measure with the ability to align managers' interests with those of the shareholders. It is further claimed that adopting the EVA framework (e.g. as a management system, or as a compensation system) will encourage managers to use the firm's resources more efficiently and make decisions that would help increase the firm's value (Wallace, 1997; Balachandran, 2006). However, one interesting aspect of this new performance metric is that it is not all that new. Value added as a concept is age-old. It has its origins in the notion of economic profit, first mentioned in the literature a century ago.[30] EVA, which specifically mentions residual income (RI), was adopted by General Motors and Matsushita in the 1920s and 1930s respectively (Young, 1999). Officially, in the mid-1990s the American Institute of Certified Financial Accountants (AICPA) recommended EVA as a type of measure that would enhance internal decision-making and would replace earnings per share (EPS), the traditional measure, in the regular stock and earnings report section (Zarowin, 1995).

This chapter will extend what was started in chapter 5 where the EVA adoption event was tested using cumulative abnormal return (CAR) and buy-and-hold abnormal return (BHAR). The results thereof reveal that firms adopting EVA as a management and compensation system outperform the market portfolio, the S&P500 and the set of matching firms. In this chapter Wallace's (1997) work will be reconsidered. I will investigate whether the adoption of EVA does indeed enhance the performance and the quality of strategic decisions of the firm. Specifically, the strategic decisions that the management will take in order to increase the value of the company and the wealth of shareholders include asset dispositions, acquisitions and capital expenditure, share repurchases, dividends and operating decisions.

[30] As Wallace (1997) stated, Alfred Marshall was the earliest to mention the residual income concept in 1890.

The structure of this chapter is as follows: Section 6.2 will discuss the work of Wallace (1997) who investigated the impact of EVA adoption on a firm's performance. Section 6.3 describes the data sources, sample selection and variable definitions. Section 6.4 describes the methodology, and Section 6.5 discusses the empirical results. Finally, Section 5.6 summarises the main conclusions.

6.2 The Wallace Study

"You get what you pay for" (Wallace, 1997).

In his seminal work, Wallace (1997) addressed the changes in profitability which a firm achieves when adopting EVA. He investigated whether the use of value added, particularly residual income, and bonus plans leads to decisions that are consistent with the economic incentives deeply embedded in those plans. Wallace claims that the "compensation plans provide one method to mitigate agency conflicts by providing incentives for managers to decisions that are in the best interest of the shareholders." (p. 277)

Wallace (1997) used a sample of 40 firms that have adopted RI- based compensation plans to test whether the adoption of the RI framework will enhance and increase the action of these firms compared to the action of other selected firms still using traditional accounting-based compensation plans. His approach is therefore based on contrasting the adopters which he calls the treatment firms, with the non-adopters which he calls the control firms. The period of investigation extends to five years prior to the adoption and up to three years following the adoption date (event date); the majority of the investigated firms adopted an RI- based compensation plan in 1993 and 1994.

Wallace begins his empirical research by discussing the consequences that a firm must face when switching to a residual income-based incentive. The focus of his work was on developing hypotheses to test investment decisions (e.g. asset dispositions, acquisition and capital expenditure), financing decisions (e.g. share repurchase, dividends) and operating decisions (e.g. asset turnover).

The findings of Wallace (1997) were that all the adopters of EVA as a compensation plan show a significant increase in residual income. With respect to the decision variables the results also show that firms adopting an RI-based compensation plan encourage managers to increase dispositions of assets and increase their payments to shareholders in the form of a repurchasing of shares and intensively utilize their assets. The results also support the axiom that "you get what you measure and reward" (Wallace, 1997, p.276). Finally, weak evidence suggests that the market does not appear to react to EVA adoption.

The work of Wallace was replicated by many scholars (Kleiman, 1999, Lovata and Costigan, 2002, Hogan and Lewis, 2005 and Balachandran, 2006). One common feature of these papers is that they discuss the compensation and incentive plan from the agency conflict's point of view. However, even though they have replicated Wallace's work (1997) they have reached different conclusions. While Wallace claims that firms that adopt EVA decrease new investment, Kleiman claims that the manager's behaviour has no obvious bias against new investment. Similarly, Hogan and Lewis find that firms that anticipate converting to the EVA compensation system would likely change their investment behaviour by reducing capital expenditure. Furthermore, to account for the pre-adoption performances they construct their own logistic model to select the optimal control-matched firms. Therefore, their control firms' sample fall into four types: anticipated adopters, surprise adopters, anticipated non-adopters, and surprise non-adopters.

In this chapter, I show that Wallace's approach needs to be reconsidered. I further extend the time horizon of study to cover the period from 1960 until 2012, and, more importantly, the number of sample firms is more than doubled to reach 89 EVA adopters. Extending the sample in both the time and the cross section dimensions will remove doubt that previous results may have been due to data limitation. However, a more important contribution in this study are the modifications introduced to the Wallace model, which are more appropriate in identifying the effect of EVA adoption before and after the adoption decision date.

6.3 Sample selection

In order to examine the impact of adopting the economic value added (EVA) on the performance of both the executive management and the company as a whole, a comprehensive sample of US EVA adopter firms from January 1960 to December 2012 was collected using the Compustat and CRSP databases. The variables used in the models in the current research were mainly extracted from balance sheets, income statements and cash flow statements. The sample was composed of firms adopting EVA during the period 1987-2001 as a compensation and management system. The selection procedures of the sample set and matching firms are discussed briefly in Chapter 5. The dependent variables are similar to that of Wallace (1997) and defined as described in the Compustat data base:

- Dispositions: sale of plant, property and equipment (SPPE).[31]
- New investment: acquisitions (AQC) plus capital expenditures (CAPX).
- Purchases per share: purchases of common stock (PRSTKCC) divided by Common Shares Outstanding (CSHO).
- Dividends per share: dividend available to common shareholders (DVC) divided by Common Shares Outstanding (CSHO).
- Assets turnover: revenue (REVT) divided by average total assets (TA).
- Inventory turnover: Cost of Goods Sold (COGS) divided by average Inventories total (INVT).
- Accounts receivable turnover: revenue (REVT) divided by average accounts receivable total (AR).
- Account payable turnover: Cost of Goods Sold (COGS) divided by average account payable trade (AP).
- ΔLeverage: changes in debt for firms between periods.

All the dependent variables are deflated by the initial total assets (TA) and used in levels rather than differences.

6.4 Methodology

The current research will use the same methodology as Wallace's (1997) except that while Wallace's sample consists of those firms adopting a residual income-based management system, we use only firms adopting EVA for incentive compensation purposes. Moreover, while Wallace used five-year returns to conduct his research, the current research uses the annual accounting data for the period 1960-2012 and focuses on the long-term effects of adopting EVA as management and compensation tools. Further, I will begin with Wallace's model, discussing its drawbacks and provide simple

[31] An abbreviation between brackets stands for COMPUSTAT Mnemonic.

numerical examples to show that the set up used by Wallace may lead to spurious results. Modifications that mitigate these problems are then proposed.

The estimated event window that was used to examine the adopter firms' behaviour is set between 30 months prior to the adoption date and 30 months after the adoption. As discussed in chapter 5, it is difficult to determine an accurate date for EVA's adoption. I therefore consider the month of December in the earliest year that the company released the adoption of EVA as the event date. This approach is also adopted by Wallace (1997), Kleiman (1999) and Balachandran, 2006

6.4.1 The Wallace Approach

Wallace (1997) analysed the firms that adopted residual income-based compensation plans. However, only 23 firms in his sample applied the EVA approach (the rest adopted residual income plans). Thus, Wallace's findings cannot be attributed to EVA alone. Rather, the effect found by Wallace should be associated with all residual income (RI) methods. Consequently it is not perfectly correct to generalize Wallace's finding that the motif detected in the selected sample would likely exist for any randomly chosen firms to the EVA compensation scheme.

Another limitation in Wallace is that he did not account for the pre-adoption operating performance. In other words, he compares the adopter firms with matching firms after adoption but fails to compare the adopter firm before and after adoption. Barber and Lyon (1996) show that the failure to capture past performance leads to biased test statistics. It is true that Wallace considered the difference in variables between the pre- and post-adoption years. However, this does not make the comparison of the two periods (before and after adoption) explicit. Wallace's (1997) approach stated that:

$$\Delta Dependent_i = \alpha + \beta_1 Type_i + \beta_2 \Delta Owner_i + \beta_3\ \Delta Leverage_i + \varepsilon_i \qquad (\mathbf{6.1})$$

where Δ refers to the difference between the mean of a particular variable before the adoption date and the average of the same variables after (and including) the adoption year. He uses increasing sample sizes for the pre- and post-adoption periods in order to assess possible differences between the short and longer term effects. $Type_i$ is an indicator variable, it equals 1 for firms adopting EVA and 0 for the matching firm,

$\Delta\, Leverage_i$ is the change leverage where leverage is defined as debt divided by whatever the total assets are in each period (Wallace p.286). Finally, $\Delta Owner_i$ refers to the change in stock ownership of the top management and board of directors.

Wallace uses this as a control variable. However, this variable is endogenous because of the possible feedback effect between top managers' stock ownership and performance. In other words, while a change in management ownership can indeed affect a firm's behaviour (such as investment decisions), the opposite is also true (i.e. a firm's behaviour can induce a change in management stock ownership). In this study we propose a better control which is both exogenous to the firm, possibly correlated with a firm's behaviour, and common to both treatment and control firms: namely, the market performance. Indeed, during market downturns, businesses are affected and this is reflected in the accounting fundamentals. The opposite is expected during market expansions. Thus, we propose the following model as equivalent to Wallace's model:

$$\Delta Dependent_i = \alpha + \beta_1 Type_i + \beta_2 \Delta Leverage_i + \beta_3 \Delta MarketReturn_i + \varepsilon_i \quad (\mathbf{6.2})$$

where $\Delta MarketReturn_i$ is the change in market performance over the same period.

6.4.2 A Modified Approach (MODIF1)

One apparent problem in the empirical results of Wallace (1997) is the very low adjusted R-square. Although some of the results are found to be significant (i.e., repurchase, turnover, and residual income), the low associated R-square suggests that the dummy (Type) as well as the other control variables do not explain a significant portion of the variability of the changes in these accounting variables.

The current research suspect that the problem lies in working with changes in variables rather than levels. Taking differences essentially takes out most of the existing cross-sectional variability. For example, suppose two variables X and Y are related by

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

However if both Y and X were random walks,

$$Y_t = Y_{t-1} + u_t$$

and

$$X_t = X_{t-1} + v_t$$

where u_t and v_t are disturbance terms, working with differences implies the following model

$$\Delta Y_t = \beta \Delta X_t + \Delta \varepsilon_t$$

this, in turn, implies

$$u_t = \beta v_t + \Delta \varepsilon_t$$

Thus the model is expressed in terms of purely random variables on both sides. Of course, the accounting variables used by Wallace may not be a purely random walk, but taking differences is likely to remove most of the existing variation in the variables.

One possible solution is to work with levels rather than differences. The following model controls for the level in the dependent variable (rather than changes) using size (TA), leverage (Debt) and market wide performance (MI). It is assumed that for each firm the level of a dependent variable after adoption is a function of the level of that variable before adoption (high level firms are more likely to continue to be high level and vice versa).

The proposed model is of the following form:

$$Dep_i^+ = \alpha + \beta_1 Dep_i^- + \beta_2 D_i + \beta_3 [D_i \times Dep_i^-] + \beta_4 TA_i^- + \beta_5 Debt_i^- + \beta_6 MI_i^+ + \varepsilon_i \qquad \textbf{(6.3)}$$

where ‘+’ refers to the post event (adoption) period, ‘-‘ refers to the pre event period, Dep_i is the dependent variable, D is a type (adopter=1) dummy, TA is total assets, Debt is debt, and MI is the S&P500 market index. All variables are calculated as averages of pre- and post- event periods.

The difference between treatment (adopters) and control firms (non-adopters) is captured by two parameters, β_2 captures the difference in the level of the dependent variable, while β_3 captures the difference in the linear relationship (slope) between the pre- and post- performance.

6.4.3 A Test based on Direct Use of the Control Firm. (MODIF2)

In both Wallace’s model and the above modification of that model the contrast between treatment firms and control firms is holistic. This means that the regressions above compare the average adopter firm with the average non-adopter firm. Although firms are matched at the selection level, they are not matched (one-to-one) at the estimation level.

At first sight, it indeed makes no difference whether one takes the mean of differences or the difference of the means. The following example demonstrates this. We assume 10 treatment firms and 10 control firms. The treatment firms' performance goes from 1 to 10, while the control firms' performance goes from 10 to 1. It is clear that whether one computes the mean of the differences (abnormal performance) or the difference of the means it makes no difference (they are zero in both instances).

Performance		**Abnormal Performance**	**Size**
Treatment Firm	**Control Firm**		
1	10	-9	1
2	9	-7	2
3	8	-5	3
4	7	-3	4
5	6	-1	5
6	5	1	6
7	4	3	7
8	3	5	8
9	2	7	9
10	1	9	9
Mean=5.5	**Mean=5.5**	**Mean = 0**	

However, in a regression the two arrangements lead to different outcomes. Suppose abnormal performance was related to a control variable, such as size. This is depicted in the above table, where size increases from 1 to 9. The last firm has a size of 9 to avoid having a perfect relationship.

If we regress abnormal performance against size, we would obtain a nearly perfect fit with an Adjusted-R^2 of more than 99%.

$$AbnormalPerformance_i = -11.32 + 2.10 Size_i$$
$$(-26.80) \quad (30.02)$$

If we were to adopt Wallace's approach we would stack the treatment and control performances together and then use a dummy variable (Type) to expectantly capture the difference between the two types of performances. The data would be arranged as follows:

Firm No.	Performance	Type	Size
1	1	1	1
2	2	1	2
3	3	1	3
4	4	1	4
5	5	1	5
6	6	1	6
7	7	1	7
8	8	1	8
9	9	1	9
10	10	1	9
11	10	0	1
12	9	0	2
13	8	0	3
14	7	0	4
15	6	0	5
16	5	0	6
17	4	0	7
18	3	0	8
19	2	0	9
20	1	0	9

A regression using the above specification gives an Adjusted-R^2 of nearly zero, while both type and size coefficients are zero.

$$\underset{}{Performance_i} = \underset{(3.24)}{5.5} + \underset{(0)}{0}Type_i + \underset{(0)}{0}Size_i$$

This approach does indeed suggest that the average performance of both types is 5.5. It also suggests no difference between the performances of the two types. However, the fact that R^2 is zero would cast doubt on the regression as a whole. We would not be able to determine whether the lack of significance is due to the actual lack of difference between the two types of firms or simply due to the lack of fit of the whole regression. More importantly, the Wallace specification completely misses the role of Size in determining the difference between the two types of firms.

If we define the average abnormal performance in the post-adoption period as

$$AP_i^+ = Performance_{i,Treatment}^+ - Performance_{i,Control}^+$$

and the pre-adoption period as:

$$AP_i^- = Performance_{i,Treatment}^- - Performance_{i,Control}^-$$

Similarly, if I defines abnormal asset and abnormal debt as the difference between the assets and debts between the treatment and control firms, respectively, that is,

$$AbnTA_i^+ = TA_{i,Treatment}^+ - TA_{i,Control}^+$$

and

$$AbnDebt_i^+ = Debt_{i,Treatment}^+ - Debt_{i,Control}^+$$

Then we propose the following model:

$$AP_i^+ = \alpha + \beta_1 AP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$$

If there is no effect resulting from the adoption, then the abnormal performance before the event should be equal on average to the abnormal performance after the event. Any possible change in abnormal performance could be due to the control variables (abnormal TA and abnormal debt). Thus, the parameter of interest is β_1, and the null hypothesis of no effect is $H_0: \beta_1 = 1$. However, we can operationalize the testing of this hypothesis by subtracting AP_i^- from both sides of the equation to obtain

$$AP_i^+ - AP_i^- = \alpha + \delta_1 AP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i \qquad (\mathbf{6.4})$$

where $\delta_1 = \beta_1 - 1$. Thus, testing $H_0: \beta_1 = 1$ is equivalent to testing $H_0: \delta_1 = 0$.

Table 6.4.1 presents summary statistics of the investigated potential investment decisions (the dependent and independent/control variables employed in models (6.2), (6.3) and (6.4)). The mean values of disposition per share for adopter firms are 27.581 and 27.739 for the matching firms. Reflecting overall expectations of negative disposition per share after EVA adoption, standard deviation in particular for matching firms is higher than the corresponding adopting firms. Interestingly, the mean new investment is 344.580 for adopting firms, whereas the mean new investment is 266.953 for matching firms, which indicates that adopting firms operate with a considerable balance of new investment rather than decreasing their expenditure on new projects. In addition it is worth noting that both adopters and matching firms are operating with a considerable leverage level. However, note that the distribution of all the potential decisions is highly skewed to the right as indicated by the large standard deviations. For most numbers the mean of adopting firms is even higher than the number for the matching firms.

In the following section the current research revisit Wallace's investigation of a number of investing, financial and operating decisions using the models proposed above.

Table 6.4.1 Selected descriptive statistics on the dependent and independent variables

Variables*	Adopter Firms			Control Firms		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Disposition	1933	27.581	93.887	2083	27.739	157.730
New Investment	3411	344.580	1236.029	3453	266.953	754.665
Purchases	3464	2.036	105.029	3585	3.068	144.384
Dividends	3441	47.038	1434.123	3573	21.017	708.013
Asset Turnover	3331	1.328	0.988	3555	1.210	0.814
Inventory Turnover	3206	10.617	29.528	3417	10.366	19.180
AR Turnover	3245	10.554	21.940	3425	16.946	177.069
AP Turnover	2886	11.882	10.317	3186	11.591	24.589
Debt	3423	1930.364	5704.894	3628	1846.283	5582.607

Note: Statistics are based on annual accounting data from 1960 to 2012. Sample sizes represent firm-years. All figures are in a thousand US dollars. *Disposition* is sale of plant, property and equipment. *New investment* is acquisitions plus capital expenditures. *Purchases* per share are purchases of common stock divided by Common Shares Outstanding. *Dividends* are dividends available to common shareholders divided by Common Shares Outstanding. *Assets turnover* is revenue divided by average total assets. *Inventory turnover* calculated as cost of goods sold divided by average inventories total. *Accounts Receivable (AR) Turnover* is defined as revenue divided by average accounts receivable total. *Accounts Payable (AP) Turnover* is the cost of goods sold divided by average account payable trade, and Debt is the company total debt.

6.5 Empirical Results

I began my analysis with the regression for equation (6.2), which is similar to that of Wallace (1997) except that $\Delta MarketReturn$ replaces $\Delta Owner$ as a control variable. Table 6.5.1 summarises the results for dispositions and new investment decisions for the period of five years before and five years after adoption (10 year window). The effect is captured by the 'Type' coefficients. Contrary to Wallace's finding, the adoption seems to have no effect on dispositions and new investment; both coefficients (-0.001 and 0.005 respectively) are insignificant and of the opposite sign to those of Wallace. Thus, over a ten-year window dispositions show no significant change, whereas in Wallace they increased by 0.01 and were statistically significant. A similar insignificant effect is found for new investment (a negative effect is found in Wallace although it is only significant at the 10% level). Note that the adjusted-R^2 is only 2% for dispositions (9% in Wallace) but 23% for new investment (1% in Wallace). This reversal of explanatory power of Wallace's specification seems erratic since extending the sample should improve the coefficient of determination in both cases. This may well be due to the possible spuriousness induced by used differences rather than levels as discussed earlier. The difference cannot be attributed to the replacement of 'ownership' in Wallace by 'market return' in this model. Both variables are insignificant in all cases. However, the only significant variable is leverage, which seems to explain nearly 23% of the variability of new investment (in Wallace leverage is insignificant). On the other hand leverage is insignificant for disposition, which explained the low adjusted-R^2 (in Wallace it is significant, explaining about 9% of the variability of new investment).

Table 6.5.2 shows the results of testing the modified version of Wallace (1997), which uses levels rather than differences (see equation 6.3). Three noteworthy results emerge from this table. First, the adjusted $\boldsymbol{R^2}$ is quite high as predicted. It moves from 2% to 85% for disposition decisions and from 23.6% to 84.77% for new investment decisions. This means that our modified model is better at capturing the variation of performances between treatment and control firms than Wallace's model. Second, the dummy variable that is assumed to capture the difference in the level of the dependent variable is insignificant for both the dispositions and new investment decisions.

However, this does not mean the absence of the adoption effect. Indeed, for dispositions, the interaction variable is significant and has a positive coefficient. The marginal effect is therefore obtained by taking partial derivatives of equation 6.3, yielding,

$$\frac{\partial Dep_i^+}{\partial D_i} = 0.299 \times Dep_i^-$$

Thus, adopter firms seem to increase dispositions (relative to control firms), but interestingly this increase is not constant and is a multiple of the pre-event level of disposition. In other words, firms with higher dispositions before adoption will increase dispositions more than those with lower pre-event dispositions.

For new investments, the effect is totally absent. Neither the control, nor the dummy variables are significant, indicating no difference between the treatment and control firms. The high coefficient of determination is exclusively due to the lagged dependent variable. The lagged dependent variable coefficient is highly significant and considerably greater than unity (coefficient=1.346). This means that there has been an overall increase in new investment by both adopter and non-adopter firms. However, in contradistinction to dispositions, the interaction term is insignificant (coefficient=0.021, p-value=0.822). This means that there is no difference in new investment decisions between adopters and non-adopters. We can speculate that this positive trend in new investment could be due either to economic growth or inflation (or both).

However, I think the new compensation plan that takes into account the time period needed to repay managers their remuneration will encourage the management to rethink of their investment strategy and start focusing more on positive projects regardless of their cash inflow timing. Consequently, I think that the time- horizon agency cost conflict is mitigated because it is already addressed by the new compensation system where payment period extends to cover a few years following the investment decision. Thus, managers will be more accountable for the quality of their decisions.

Table 6.5.1 Investing decisions (Wallace's Model, Equation 6.2)

	Independent Variables				
$\Delta Dependent_i$	*Constant*	$Type_i$	$\Delta Leverage_i$	$\Delta MarketReturn_i$	*ADJ-* R^2
Dispositions					
Coefficient	0.002	-0.001	0.010	-0.011	2.00%
t-statistics	1.048	-0.281	1.076	-0.911	
p-*value*	0.297	0.779	0.284	0.364	
New investment					
Coefficient	0.004	0.005	0.251	0.026	23.60%
t-statistics	0.502	0.412	6.889	0.520	
p-*value*	0.616	0.681	0.000	0.604	

Results are reported for Equation (6.2): $\Delta \text{Dependent}_i = \alpha + \beta_1 \text{Type}_i + \beta_2 \Delta \text{Leverage}_i + \beta_3 \Delta \text{MarketReturn}_i + \varepsilon_i$ where ΔDependent changes in the dependent variable, Type_i is an indicator variable, for a firm adopting EVA equal to 1 and 0 matching firm, Δ Leverage_i is the change leverage where leverage is defined as debt divided by whatever the total assets are in each period and ε_i is the error terms. Asset disposition and new investment are the dependent variables.

Table 6.5.2 Investing decisions (New Model, Equation 6.3)

	Independent Variables							
Dep_i^+	*Constant*	*Type*	Dep_i^-	$Type \times Dep_i^-$	TA_i^-	$Debt_i^-$	MI_i^+	$ADJ\text{-}R^2$
Dispositions								
Coefficient	0.687	3.106	1.016	0.299	0.001	0.001	-0.001	85.00%
t-statistics	0.054	0.458	10.046	2.534	0.401	0.269	-0.102	
p-*value*	0.957	0.648	0.000	0.013	0.689	0.788	0.919	
New investment								
Coefficient	-74.182	-10.620	1.346	0.021	-0.005	-0.014	0.110	84.77%
t-statistics	-0.661	-0.179	10.298	0.226	-0.522	-0.567	1.031	
p-*value*	0.509	0.858	0.000	0.822	0.603	0.572	0.304	

Results reported for the modified version of Wallace (1997). Equation (6.3): $Dep_i^+ = \alpha + \beta_1 Dep_i^- + \beta_2 D_i + \beta_3 [D_i \times Dep_i^-] + \beta_4 TA_i^- + \beta_5 Debt_i^- + \beta_6 MI_i^+ + \varepsilon_i$, where '+' refers to the post event (adoption) period, '-' refers to the pre- event period, Dep_i is the dependent variable, D is a type (adopter=1) dummy, TA is total assets, Debt is debt, and MI is the S&P500 market index. All variables are calculated as averages of pre- and post- event periods. Asset disposition and new investment are the dependent variables.

Table 6.5.3 shows the results obtained from running equation 6.4, which uses abnormal dependent and independent variables. The models explain a fairly good proportion of variability in abnormal dispositions and abnormal new investments (the adjusted-$\boldsymbol{R^2}$ are 30.62% and 48.34% respectively). As discussed earlier, $\boldsymbol{\delta_1}$ the coefficient of lagged performance is the parameter of interest and we are testing for the null hypothesis that there is no effect ($\boldsymbol{H_0}: \delta_1 = 0$) of adoption on firm performance. The result shows that we fail to reject the null hypothesis for dispositions. Consequently, the adoption of EVA, contrary to Wallace, has not changed the disposition of assets (like with like, abnormal dispositions before adoption are not different from abnormal dispositions after adoption). The growth or decline in abnormal dispositions is mostly explained by the differential size and differential leverage. In the first case, the coefficient of $AbnTA_i^+$ equals -0.035 and is highly significant, implying that larger adopter firms have decreased dispositions. On the other hand, more leveraged adopter firms have increased their dispositions relative to non-adopters (the coefficient of $AbnDebt_i^+$ is 0.065 and significant at the 1% level).

On the other hand, the current research reject the null hypothesis that there are no effects of adoption on new investment decisions. The coefficient of lagged abnormal new investment, δ_1 equals -0.966 and is highly significant. This is clear evidence that abnormal new investment has decreased significantly after adoption. This result is much stronger statistically than Wallace's negative impact which is found to be weakly significant with a p-value of 0.09. The control variables are also significant (but size is only weakly significant). First, while abnormal size has a negative impact on dispositions, it has a positive effect on new investments. This is expected since larger firms have greater ability to invest in absolute terms. However, abnormal leverage has a significant coefficient but with an unexpected sign. Thus, while abnormally high leveraged firms see higher abnormal dispositions they (unexpectedly) also see higher abnormally new investment.

Table 6.5.3 Investing decisions (New Model, Equation 6.4)

	Independent Variables				
$AP_i^+ - AP_i^-$	*Constant*	AP_i^-	$AbnTA_i^+$	$AbnDebt_i^+$	*ADJ-* R^2
Dispositions					
Coefficient	9.074	0.104	-0.035	0.065	30.62%
t-statistics	1.133	0.971	-3.120	3.179	
p-*value*	0.265	0.338	0.004	0.003	
New investment					
Coefficient	43.806	-0.966	0.020	0.070	48.34%
t-statistics	1.339	-7.378	1.954	3.575	
p-*value*	0.185	0.000	0.055	0.001	

Results reported for the modified version of Wallace (1997). Equation (6.4): $AP_i^+ - AP_i^- = \alpha + \delta_1 AP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$, where AP_i^+ is the abnormal performance after the adoption, AP_i^- is the abnormal performance before the adoption, $AbnTA_i^+$ is the abnormal total asset after the adoption, $AbnDebt_i^+$ is the abnormal debt after the adoption and ε_i is the error terms. Asset disposition and new investment are the dependent variables.

Tables 6.5.4, 6.5.5 and 6.5.6 show the results for the Wallace model (equation 6.2), the level model (equation 6.3), and the abnormal performance model (equation 6.4), respectively. The tables show the results for repurchase and dividends decisions and show different results regarding what happens to financing decisions after the adoption of the EVA compensation plan over a ten-year window. Table 6.5.4 shows a pattern similar to investment decision in Table 6.5.1. Contrary to Wallace's findings, the effect that is captured by the 'type' coefficient shows that EVA's adoption has no effect on repurchases and dividends decisions; the coefficients for repurchases and dividends (0.0004 and -0.009 respectively) are both insignificant. While the results of Table 6.5.4 suggest that no significant change in repurchases or dividends is found after the adoption of EVA, Wallace reports a high and significant increase in repurchase by 1.11. However, our result agrees with Wallace for dividends (the coefficient in Wallace was 0.17 but statistically insignificant). The adjusted- $\boldsymbol{R^2}$ is quite low, only 2.39% for repurchase (8% in Wallace) and 1.88% for dividends (-0.000 in Wallace). This confirms the inappropriateness of Wallace's specification. Like Wallace, neither of the other variables ($\Delta leverage$ and $\Delta MarketReturn$) are statistically significant on conventional levels.

Table 6.5.5 describes the results after running the modified version of Wallace (1997) as given by equation 6.3. The effect of working with levels is quite clear. The Adjusted-$\boldsymbol{R^2}$ are much higher than in the Wallace model (increasing from 2.39% to 14.20% for repurchase decisions and from 1.88% to 64.06% for dividends decisions). This means the new modified model is certainly an improvement on the Wallace model.

For repurchases, two out of the three control variables are significant. The performance of the market seems to play no role on repurchase behaviour. However, Leverage reduces repurchases while size has the opposite effect. More importantly, the dummy variables coefficient is positive and highly significant whereas the interaction term is insignificant (although the coefficient seems large and negative at -0.172, the p-value is very high). Since the interaction term is insignificant, the effect of adoption on repurchases is fully reflected in the type dummy coefficient, that is, EVA adopters on average increase their repurchases by 0.262 million dollars.

For dividends, the results are different. While size and leverage are significant and have nearly identical effect, the market index is significant but negative, which suggests that high markets see relatively lower levels of dividends. However, a more interesting finding is that now both the type dummy and the interaction variables are significant. However, while the dummy coefficient is positive (0.364), the interaction coefficient is negative. Hence the adoption effect is complex. We can see this effect through the marginal effect simply by taking partial derivatives of equation 6.3. This yield

$$\frac{\partial Dep_i^+}{\partial D_i} = \beta_2 + \beta_3 Dep_i^- = 0.364 - 0.496 \times Dep_i^-$$

for dividends.

Thus the firms with relatively high dividends before adoption tend to reduce dividends after adoption and vice versa. Specifically, those with pre-adoption dividends of less than 0.734 tend to increase their dividends after adoption.

The above results for repurchases are consistent with Wallace (1997) and Kleiman (1999). However, while Wallace reported insignificant effects for dividends, the results of Table 6.5.5 show that the effect is significant but depends on the prior dividend policy of the firm. This seems to be partly consistent with the agency theory concept which states that a manager is not in favour of giving shareholders any promises regarding the amount of the dividend they intend to pay in the future because from the shareholders' point of view any increase in the amount of the dividend the manager promises to pay will become an obligation in the future. To alleviate the consequences of minimizing dividends in their relation with shareholders the manager will focus on the repurchasing of shares to enhance the share prices movement in the stock market and as a result any shareholder seeking extra cash can easily perform the selling of these shares at a better price. The results so far only confirm the second conclusion relating to increasing repurchases by managers. However, the first part of the theory, namely that managers are reluctant to increase dividends, is not supported. Some managers (with low historical dividends) may actually increase dividends after adopting EVA, while others (whose historical dividends were high) will decrease them.

In the third model, the results in Table 6.5.6 are obtained from running equation 6.4. The adjusted-$\boldsymbol{R^2}$ is extremely high for dividends (=99.86%) and reasonably high for repurchases (=32.14%). This means that the models explain a very good proportion of variability in abnormal repurchases and abnormal dividends. The coefficient of lagged performance,δ_1, is the parameter of interest. Contrary to Wallace, the results show a fall in abnormal repurchase and dividends. The null hypotheses ($\boldsymbol{H_o}: \boldsymbol{\delta_1} \neq \mathbf{0}$) for repurchases and dividends are strongly rejected; both coefficients (-0.695 and -0.998 respectively) are significant and negative, implying the reversal of the effect found in Wallace. Thus, our result suggests that while repurchases seem to increase in Wallace's study, this study suggest the opposite. Furthermore, while EVA adoption has no effect on dividends, this study finds strong and negative effect.

On the other hand, the coefficients of the control variable $\boldsymbol{AbnTA^+}$ and $\boldsymbol{AbnDebt^+}$ (0.00002, -0.00005 respectively) for repurchase are small and insignificant. This implies that the difference in either size or leverage between adopter and control firm does not explain the change in abnormal repurchases and abnormal dividends across the pre- and post-adoption periods. The same conclusion applies to the dividends case. The coefficients of the abnormal size and abnormal leverage are insignificant.

Table 6.5.4 Financing decisions (Wallace's Model, Equation 6.2)

	Independent Variables				
$\Delta Dependent_i$	*Constant*	$Type_i$	$\Delta Leverage_i$	$\Delta MarketReturn_i$	*ADJ-* R^2
Repurchase					
Coefficient	-0.00004	0.00037	0.00036	0.00125	2.39%
t-statistics	-0.19449	1.447	0.475	1.207	
p-*value*	0.84604	0.150	0.635	0.229	
Dividends					
Coefficient	-0.001	-0.009	0.036	0.002	1.88%
t-statistics	-0.089	-1.035	1.423	0.059	
p-*value*	0.929	0.302	0.157	0.953	

Results are reported for Equation (6.2): $\Delta Dependent_i = \alpha + \beta_1 Type_i + \beta_2 \Delta Leverage_i + \beta_3 \Delta MarketReturn_i + \varepsilon_i$ where $\Delta Dependent$ refers to changes in the dependent variable, $Type_i$ is an indicator variable, for a firm adopting EVA equal to 1 and 0 matching firm, $\Delta\ Leverage_i$ is the change leverage where leverage is defined as debt divided by whatever the total assets in each period are and ε_i is the error terms. Repurchase and dividend per share are the dependent variables.

Table 6.5.5 Financing decisions (New Model, Equation 6.3)

	Independent Variables							
Dep_i^+	*Constant*	*Type*	Dep_i^-	$Type \times Dep_i^-$	TA_i^-	$Debt_i^-$	MI_i^+	*Adjusted-*R^2
Repurchase								
Coefficient	0.260	0.262	0.371	-0.172	0.0001	-0.0001	0.0001	14.20%
t-statistics	0.850	1.614	3.991	-0.978	2.731	-2.377	0.003	
p-*value*	0.396	0.009	0.000	0.350	0.007	0.019	0.693	
Dividends								
Coefficient	0.947	0.364	0.493	-0.496	0.0001	-0.0001	-0.001	64.06%
t-statistics	4.997	3.869	14.206	-14.284	3.475	-2.793	-4.512	
p-*value*	0.000	0.000	0.000	0.000	0.001	0.006	0.000	

Results reported for the modified version of Wallace (1997). Equation (6.3): $Dep_i^+ = \alpha + \beta_1 Dep_i^- + \beta_2 D_i + \beta_3[D_i \times Dep_i^-] + \beta_4 TA_i^- + \beta_5 Debt_i^- + \beta_6 MI_i^+ + \varepsilon_i$, where '+' refers to the post-event (adoption) period, '-' refers the pre-event period, Dep_i is the dependent variable, D is a type (adopter=1) dummy, TA is total assets, Debt is debt, and MI is the S&P500 market index. All variables are calculated as averages of pre- and post- event periods. Repurchase per share and dividends per share are the dependent variables.

Table 6.5.6 Financing decisions (New Model, Equation 6.4)

	Independent Variables				
$AP_i^+ - AP_i^-$	*Constant*	AP_i^-	$AbnTA_i^+$	$AbnDebt_i^+$	*Adjusted-*R^2
Repurchase					
Coefficient	0.14652	-0.69497	0.00002	-0.00005	32.14%
t-statistics	1.116	-5.788	0.638	-0.586	
p-*value*	0.268	0.000	0.525	0.560	
Dividends					
Coefficient	-0.03141	-0.99844	0.00001	-0.00002	99.86%
t-statistics	-0.288	-230.614	0.346	-0.249	
p-*value*	0.774	0.000	0.731	0.804	

Results reported for the modified version of Wallace (1997). Equation (6.4): $AP_i^+ - AP_i^- = \alpha + \delta_1 AP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$, where AP_i^+ is the abnormal performance after the adoption, AP_i^- is the abnormal performance before the adoption, $AbnTA_i^+$ is the abnormal total asset after the adoption, $AbnDebt_i^+$ is the abnormal debt after the adoption and ε_i is the error terms. Share repurchases and dividends are the dependent variables.

Turning to operating decisions, Table 6.5.7 shows the result obtained from running equation 6.2 in which $\Delta \boldsymbol{Owner_i}$ is replaced by $\Delta \boldsymbol{MarketReturn_i}$ as a control variable. The table shows the results for Asset, Inventory, Accounts Receivable, and Accounts Payable turnovers.

The first note is that, similar to Wallace, the coefficients of determination are quite low, suggesting overall inadequacy of the Wallace model. The only weakly significant variable is the market return with a p-value of 7.5%. The remaining variables are all insignificant including the 'Type' dummies, which are all highly insignificant. In Wallace, the adoption has a positive effect for Asset turnover and Accounts receivable (although both coefficients are only significant at the 10% level respectively).

Thus, partly negating Wallace's results and using the same model, we find no effect of EVA adoption on the four operating decisions considered by Wallace, whereas he finds increased asset turnover and accounts receivable turnover.

The change in operating decisions seems extremely hard to explain using Wallace's model. The most convincing explanation seems to be made by the change in market return ($\Delta \boldsymbol{MarketReturn_i}$), which seems to explain 2.84% of the variability of assets turnover (in Wallace the adjusted-$\boldsymbol{R^2}$ = 11%). The remaining coefficients of determination are nearly zero (and all negative in Wallace), which confirms the possibility that we are trying to estimate mainly random variation as discussed previously.

When the model is modified, using levels rather than differences, the results change substantially. First, the adjusted-$\boldsymbol{R^2}$ for all dependent variables are high suggesting that, the explanatory variables capture a good proportion of the variability in the level of the four turnover variables. In all cases, none of the control variables is significant, indicating that the explanatory power of the four models is due to a lagged dependent variable and/or the type dummy.

The results of Wallace are reversed in three out of four cases. First, for asset turnover, the coefficients of the type dummy and the interaction terms are both insignificant. Thus, there seems to be no EVA effect for this type of operating decisions (it is positive and significant in Wallace (Table 5, p.291)).

Second, for inventory turnover, Wallace finds no effect, whereas here the coefficient of the interaction term is positive and significant (although the type dummy is insignificant). This suggests a marginal effect of

$$\frac{\partial Dep_i^+}{\partial D_i} = 0.608 \times InventoryTurnover_i^-$$

In other words, the effect of EVA adoption is proportional to pre-adoption levels of inventory turnovers. Thus high inventory turnover adopter firms will see their inventory turnover increase by more than low pre-adoption inventory turnover firms.

Third, for A/R turnover, Wallace finds a positive effect (albeit weakly significant). In this study, the results show strong statistical significance of both type dummy and interaction variables. The marginal effect is

$$\frac{\partial Dep_i^+}{\partial D_i} = 12.310 - 1.416 \times A/R\ Turnover_i^-$$

This suggests that the behaviour can vary from positive to negative, depending on the level of pre-event AR turnover. For low turnover firms, there is a tendency to increase AR turnover following adoption of EVA. On the other hand, if turnover is more than 8.69 (=12.31/1.416) before adoption the firm will tend to reduce its AR turnover after adoption and vice versa.

The final operating decision is accounts payable turnover. Here the results are in line with Wallace as neither dummy nor interaction term coefficient is significant.

The results in Table 6.5.9 show a different story. In comparison to Wallace's finding, our modified version (equation 6.4) explains a very high proportion of variability in abnormal asset turnover, inventory turnover, and AR turnover (the adjusted-$\boldsymbol{R^2}$ are 54.66%, 38.19%, and 93.70% and 17.00% respectively), although the AP turnover has a lower adjusted-$\boldsymbol{R^2}$ (17%). As discussed earlier, $\boldsymbol{\delta_1}$, the coefficient of lagged performance ($\boldsymbol{AP_i^-}$) is the parameter of interest and we are testing for the null hypothesis that there is no effect ($\boldsymbol{H_0: \delta_1 = 0}$) of EVA adoption on firm performance. The result shows that we strongly reject the null hypothesis for all turnovers. Thus the adoption of EVA has affected the operating decisions the managers take in regard to turnovers. The effects are similar for asset turnover, AR turnover and AP turnover. In these three operating decision variables, none of the control variables is significant. The coefficients of the lagged performance ($\boldsymbol{AP_i^-}$) in all three cases are negative and highly significant. This suggests that these turnovers are significantly reduced after the adoption of EVA compared with matching control firms. The biggest reduction is in AR turnover (coefficient=-0.960). In contrast Wallace finds a positive, rather than negative, effect of EVA adoption on asset turnover and AR turnover, and finds no effect on AP turnover.

The results for inventory turnover are quite different. Here, the effect is positive (the coefficient for lagged performance=0.544) and highly significant. Therefore adopters clearly increase their inventory turnover following the adoption of EVA. The control variables are also highly significant but with opposing signs. The abnormal size ($\boldsymbol{AbnTA_i^+}$) has a coefficient of -0.004 with p-value of nearly zero, whereas the abnormal leverage ($\boldsymbol{AbnDebt_i^+}$) has a positive coefficient (=0.007) which is significant at the 1% level.

In contrast to this positive effect, Wallace finds that EVA adoption has no significant effect on inventory turnover.

Table 6.5.7 Operating decisions (Wallace's Model, Equation 6.2)

$\Delta Dependent_i$	*Constant*	$Type_i$	$\Delta Leverage_i$	$\Delta MarketReturn_i$	*ADJ-* R^2
	Independent Variables				
Asset Turnover	+/-	+	+		
Coefficient	-0.003	0.001	0.003	0.012	2.84%
t-statistics	-2.928	0.875	0.723	1.792	
p-*value*	0.004	0.383	0.471	0.075	
Inventory Turnover	+/-	+	+		
Coefficient	0.014	-0.018	0.001	0.14	0.95%
t-statistics	0.612	-0.549	0.013	1.054	
p-*value*	0.542	0.584	0.99	0.293	
AR Turnover	+/-	+	+		
Coefficient	-0.014	-0.023	0.066	0.097	1.56%
t-statistics	-0.787	-0.905	0.878	0.925	
p-*value*	0.432	0.367	0.381	0.356	
AP Turnover	+/-	-	-		
Coefficient	-0.01	-0.003	-0.022	0.011	0.67%
t-statistics	-1.657	-0.317	-0.936	0.327	
p-*value*	0.099	0.752	0.351	0.744	

Results are reported for the Equation (6.2): $\Delta Dependent_i = \alpha + \beta_1 Type_i + \beta_2 \Delta Leverage_i + \beta_3 \Delta MarketReturn_i + \varepsilon_i$ where $\Delta Dependent$ is the change in the dependent variable, $Type_i$ is an indicator variable, for firms adopting EVA equal to 1 and 0 matching firm, $\Delta\ Leverage_i$ is the change leverage where leverage is defined as debt divided by whatever the total assets are in each period and ε_i are the error terms. The turnovers are the dependent variables.

Table 6.5.8 Operating decisions (New Model, Equation 6.3)

	Independent Variables							
Dep_i^+	*Constant*	*Type*	Dep_i^-	$Type \times Dep_i^-$	TA_i^-	$Debt_i^-$	MI_i^+	*Adjusted-*R^2
Asset Turnover								
Coefficient	0.128	0.084	0.831	-0.048	-5.00E-05	8.00E-05	-2.00E-05	85.24%
t-statistics	1.244	1.042	20.044	-0.876	-0.840	0.630	-0.014	
p-*value*	0.215	0.299	0.000	0.383	0.402	0.530	0.889	
Inventory Turnover								
Coefficient	0.668	-2.921	0.846	0.608	0.001	-0.001	0.003	57.24%
t-statistics	0.114	-0.838	3.819	2.464	0.836	-0.969	0.543	
p-*value*	0.910	0.403	0.000	0.015	0.404	0.334	0.588	
AR Turnover								
Coefficient	-5.482	12.310	1.510	-1.416	-1.70E-04	3.80E-04	0.002	44.77%
t-statistics	-1.541	5.975	10.264	-9.509	-0.513	0.577	0.708	
p-*value*	0.125	0.000	0.000	0.000	0.608	0.565	0.480	
AP Turnover								
Coefficient	3.445	-0.538	0.759	-0.036	-1.00E-04	1.00E-04	-0.001	57.06%
t-statistics	1.481	-0.303	6.943	-0.289	-0.515	0.321	-0.384	
p-*value*	0.141	0.762	0.000	0.773	0.607	0.748	0.702	

Results reported for the modified version of Wallace (1997). Equation (6.3): $Dep_i^+ = \alpha + \beta_1 Dep_i^- + \beta_2 D_i + \beta_3 [D_i \times Dep_i^-] + \beta_4 TA_i^- + \beta_5 Debt_i^- + \beta_6 MI_i^+ + \varepsilon_i$. where '+' refers to the post-event (adoption) period, '-'refers to the pre-event period, Dep_i is the dependent variable, D is a type (adopter=1) dummy, TA is total assets, Debt is debt, and MI is the S&P500 market index. All variables are calculated as averages of pre- and post- event periods. Turnovers are the dependent variables.

Table 6.5.9 Operating decisions (New Model, Equation 6.4)

$AP_i^+ - AP_i^-$	Independent Variables				
	Constant	AP_i^-	$AbnTA_i^+$	$AbnDebt_i^+$	*ADJ-* R^2
Asset Turnover					
Coefficient	0.049	-0.461	-3.802E-07	-3.523E-07	54.66%
t-statistics	1.341	-9.242	-0.045	-0.021	
p-*value*	0.184	0.000	0.964	0.838	
Inventory Turnover					
Coefficient	1.922	0.544	-0.004	0.007	38.19%
t-statistics	0.772	3.275	-5.537	5.116	
p-*value*	0.443	0.002	0.000	0.000	
AR Turnover					
Coefficient	-0.650	-0.960	-0.00001	0.00009	93.70%
t-statistics	-0.432	-31.810	0.021	0.104	
p-*value*	0.667	0.000	0.984	0.918	
AP Turnover					
Coefficient	-0.997	-0.372	-0.00004	0.00007	17.00%
t-statistics	-0.896	-3.736	-0.126	0.115	
p-*value*	0.373	0.000	0.900	0.909	

Results reported for the modified version of Wallace (1997). Equation (6.4): $AP_i^+ - AP_i^- = \alpha + \delta_1 AP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$, where AP_i^+ is the abnormal performance after the adoption, AP_i^- is the abnormal performance before the adoption, $AbnTA_i^+$ is the abnormal total asset after the adoption, $AbnDebt_i^+$ is the abnormal debt after the adoption and ε_i is the error terms. Turnovers are the dependent variables.

6.6 Conclusions

In this chapter we have examined the long-term effects of adopting economic value added (EVA) as compensation and management tools on top management potential decisions that a manager chooses in order to increase the shareholder wealth and better align the interest of managers and shareholder. The current research chose a set of decisions that we expect (as Wallace also did) will increase the company value and shareholder wealth. These decisions are the investing decisions (e.g. asset disposition and new investment decisions), financing decisions (e.g. share repurchase and dividends decisions) and operating decisions (e.g. asset turnover, inventory turnover, AR turnover and AP turnover). In this context Wallace (1997) claims that managers would increase asset disposition and turnover, repurchases per share, dividends, inventory turnover and receivable turnover and decrease new investment and payables turnover.

The model by Wallace is modified in several ways. First it is modified by introducing the market return index (S&P500) as a control variable to replace the change in ownership in Wallace's original model. Second, a model is proposed that uses levels rather than differences. Third, a modified model is proposed that uses abnormal measures of dependent and independent variables. These two modifications are arguably better able to capture any significant effect in the EVA adopter firms' performances after the adoption date. The findings are summarised in Table 6.6.1.

The table reveals two sets of results. The first set is not surprising and is related to econometric considerations regarding model selection. The second set, which is related to firm behaviour, is surprising as only a single prediction by Wallace is matched by this study's selected model (see New Investment under "Abnormal Measures Model").

With regard to the econometric considerations, we note that the empirical findings are sensitive to both the choice of model and the sample size. First, in Wallace's study, 5 out 8 cases are significant, but in this study's extended sample, none of the variables is significant (see "Wallace Model" column in Table 6.6.1) even though the same model was employed (although we have not matched Wallace's model perfectly, it is unlikely that the replacement of the ownership variable used in Wallace by the market return has had any impact since they are both insignificant).

We contend that Wallace's model was simply attempting to regress some control variables on dependent variables that are dominated by noise. The consistently low adjusted coefficients of determination confirm the suspicion that Wallace's regression is probably spurious.

The first modification adopted here is to use levels rather than differences. The explanatory power of the 8 regressions is improved significantly, but that is expected in models using levels. Nevertheless, the results do not match all Wallace's predictions. There are only two agreements (dispositions and repurchases) where EVA adoption is found to have a positive impact. In two cases (new investment and asset turnover) the impact is significant in Wallace but insignificant here. In the other two cases (dividends and inventory turnover) it is the opposite. Only in the final case (AP turnover) are the two models similar (i.e. insignificant). Although, the level model is more credible statistically and although it leads to some interesting firm behaviour for dividends and AR turnover (in that the EVA adoption impact could be both negative and positive), it still suffers from a major shortcoming.

The problem with the model in levels is that it still fails to match the treatment firm with the control firm on a one-to-one basis. So the results produced by this specification contrast the average treatment firm with the average control firm. This is only appropriate in the special case where the difference between each treatment and control firm cannot be explained by a control variable such as leverage or size, otherwise, as was demonstrated earlier in the chapter, the results can be totally spurious.

A model that solves these issues and one that is robust to the extent that the differential between treatment and control behavioural is dependent on some control variable is the last modification, which is labelled "abnormal measures model" in Table 6.6.1. This is the preferred model upon which the empirical and economic interpretation will be based.

Table 6.6.1 Summary of Results

Variable (Predicted Sign)	*Wallace Study*	*Wallace Model*	*Non-Matching using Levels*	*Abnormal Measures Model*
Dispositions (+)	Positive	nr	Positive	nr
New investment (-)	Negative	nr	nr	Negative
Repurchases (+)	Positive	nr	Positive	Negative
Dividends (+)	Nr	nr	Positive/Negative	Negative
Asset Turnover (+)	Positive	nr	nr	Negative
Inventory Turnover (+)	Nr	nr	Positive	Positive
AR Turnover (+)	Positive	nr	Positive/Negative	Negative
AP Turnover (-)	Nr	nr	nr	Negative

nr = no significant relationship

Turning to the second set of results, and using the selected model (last column in Table 6.6.1) the note is that only one of Wallace's conclusions is matched. The new investment was predicted and found to be negative by Wallace and this study is in line with that finding. An explanation of the negative impact of EVA adoption on new investment might include the possibility that when adopting EVA as a compensation plan and management tool, the criterion managers used to choose among alternative investments (projects) change, in such a way that the selected new investments have the ability to earn more than the embedded cost of debt financing. Thus, in order to increase firm value by generating more earnings, managers will avoid over-investing, particularly in those investments that might earn less than the opportunity cost of capital finance.

In the remaining seven variables, there is no agreement with Wallace. While Wallace finds a positive effect for dispositions, this study finds no significant effect. A possible reason for this discrepancy might refer to the nature of the assets adopter firm owned and to the attractiveness of these assets for other companies. Some outside firms may believe that the adopter firm assets are in the most efficient user's hands and may be willing to offer a price that is high enough to tempt the adopter firm to sell the asset. However, it is also possible that other firms may believe the opposite. The result of this study is consistent with a mixed response by firms such that some adopter firms increased their dispositions while others decreased them. The insignificant results suggest that the two effects are cancelled out.

In repurchases and dividends, Wallace finds a positive effect while it is negative here. A possible reason is that managers, in order to maximize their own personal benefit, begin retaining free cash flows. One reason for this retention is to insulate the firm from the capital market that serves as a monitoring instrument by subjecting any extra capital needs of the firm to impartial scrutiny. To avoid capital market monitoring, managers will only use the existing cash reserves that have been accumulated to finance new projects (contrary to the results I achieved) rather than paying it out to shareholders (Jensen, 1993). A possible, more interesting, reason for managers to avoid paying out cash flow is the desire to maximize the firm size.[32] Further, managers have more of a tendency towards preventing shareholders from getting more cash than discouraging them from redirecting capital to a more productive use. Moreover, firms are reluctant to increase dividends payment particularly when they are unsure about the availability of future free cash flows and whether they can sustain the same payout ratio (dividends are sticky). Moreover, firms are more likely to prefer to finance share repurchases from the excess cash they generate from non-recurring items rather than using the free cash flow they generate from core activities (Miller and Rock, 1985). However, the stated purpose of the long-term incentives scheme is to align the interests of managers with that of shareholders. To the extent that these long-term compensation plans encourage managers to develop growth opportunities, a significant fall in dividends (relative to control firms) can only be accepted if it is accompanied by a significant increase in new investments. Unfortunately, this is not the case. Both new investments and dividends/repurchases have fallen in relative terms.

When examining the measures of turnovers, asset turnover, accounts receivable turnover, and inventory turnover the result obtained showed decreases in asset turnover and both the accounts receivable and account payables turnovers, and also showed an increase in inventory turnover. Wallace found a positive accounts receivable and asset turnover and a negative account payables turnover and reported a insignificant relationship for inventory turnover. However, as discussed before, some managers have some tendency to increase the firm size through accumulating sub-optimal assets, which would lead to an increase in the asset base, asset turnover, and accounts receivable. At the same time, we would expect accounts payable to decrease following the adoption.

[32] Murphy (1985) documents a positive correlation between total management compensation and firm size.

Overall, it is hard to choose between any of the proposed two models as a candidate for detecting abnormal performance. While the Wallace-Level model has interesting findings, it may be spurious. On the other hand, while the Abnormal-Measure model is more robust statistically, the results are hard to explain.

Thus, there are both econometric and empirical implications. Econometrically, more elaborate simulation studies may be required to establish the performance of matching and non-matching models. Empirically, the results may be sensitive to several factors. First, it is possible that an important factor is missing from the model. The models in this study use size and leverage as firm characteristics and market return as a market wide control factor. Other characteristics such as firm age and industry may be influential. Second, the matching procedure may not produce accurate benchmarks. Following previous studies, the SIC code was used here to match treatment and control firms. This could possibly be improved by increasing the number of matching characteristics to include firm characteristics such as size, leverage and systematic risk (beta).

Elsewhere, the effective corporate governance suggests that boards should strive to align executive and board remuneration with the longer-term interests of the company and its shareholders and the long-term incentive schemes are alike. Recently, compensation policies which emphasise long-term profitability only and bonus pay-outs have been tied to the current performance with sufficient care for future risk and revenue profiles. Thus, the focus of the firms' manager is to increase the shareholder wealth and to increase the firm value. To my knowledge I think this is the correct reason for the bias in the returns obtained as indicated by the proposed models.

Chapter 7
Conclusions and Recommendations

7.1 Introduction

This chapter aims to highlight the main results and findings of the research, draw conclusions and research contributions and implications. In addition, the chapter highlights the research limitations and provides insight and direction for potential future research.

7.2 Main research findings

The long-standing debate about the superiority of performance measures in explaining the variation in stock price and stock return performances and what motivates researchers and investors to select from these measures has by no means been resolved through this study as further research is still called for. However, previous researchers (i.e. US and UK studies) had attempted to use different methodologies and different proxies for the accounting variables to explain the association between a selected performance measure and stock return (price) performances. Furthermore, most of that research replicates the work of Biddle *et al.,* (1997) where the focus in methodology were on the traditional evaluation components of the Ohlson (1995) model. Thus, the results they obtained were mixed and contradictory regarding the superiority of performance metrics.

The current research attempts to overcome these contradictions within the results obtained utilising different research strategies by first, extending the methodology of Biddle *et al.* by introducing the book value (BV) as a major explanatory variable with other performance measures into the price and return valuation model as a determinate of the share price (Ohlson, 1995). Second, applying the same methodology over the extending period 1960 to 2012 and finally using the same definition and calculation of the variables used to conduct this research. Further, I have adopted the most popular evaluation method: the price and return model.

This study aimed to fill the apparent gaps in the literature. The overarching objective was to examine the association of a set of performances, namely the net income available to common (NI), earnings before interest, tax and amortization and depreciation (EBIDA), earnings before interest and tax (EBIT), earnings before extraordinary items (EBEI), net cash flows from operations (CFO), cash value added (CVA) and economic value added (EVA), with stock price (return) performances. I then extended the research to test for the incremental information of these variables. Subsequently, the main performance measures, the net income (NI) and the economic value added, were decomposed into the main components to examine whether the components contained more value than the original measures.

The problem addressed in chapters 6 and 7 is *"How will the adoption of economic value added (EVA) affect the long-term performance of adopting firms regarding the investing, financing and operating decisions?"* In order to address this issue I used the commonly used aggregation method, the cumulated average abnormal return (CAAR) and buy-hold abnormal return (BHAR), to test for any changes in treatment firms' performances after adoption. Then, in order to examine the long-term adoption effects, I extended the work of Wallace (1997) in several ways. First it was modified by introducing the market return index (S&P500) as a control variable to replace the change in ownership in Wallace's original model. Second, a model is proposed that uses levels rather than differences. Third, a modified model is proposed that uses abnormal measures of dependent and independent variables.

The key findings and related conclusions in response to research questions and objectives as outlined in the introduction, literature, and methodology chapters can be classified into three categories as presented below.

7.2.1 Findings for the value relevance and incremental information content of performance measures

The result obtained with regard to value relevance showed that the adjusted- R^2 , the criterion I used to gauge the value relevance of performance measures, increased rapidly after the incorporation of BV into the price model as an explanatory variable. This means that our extended model is better at capturing the variation of stock performances than the Biddle *et al.* model (in Wallace it is significant, explaining about 9.04% of the variability of stock performance in the best case where it is significant and explains about 79.82% of the variability of stock performance when applying our extended model). When applying the price model, the CFO has the highest explanatory power among the other variables (adjusted- R^2 =79.82%). The remaining performance measures are in the following order with regard to their value relevance: EBITDA (adjusted- R^2 =77.90%), EVA (adjusted- R^2 =77.32%), EBIT (adjusted- R^2 =77.30%), (NI and EBEI (adjusted- R^2 =76.55%) and CVA (adjusted- R^2 =76.00%).

In addition the results show that EBITDA (adjusted- R^2 =15.14%) is the dominant variable when we used the return model following earnings before interest and tax (EBIT) but the adjusted- R^2 is quite low compared to that obtained by the price model.

With regard to the incremental information content, the result indicates that there is significant evidence regarding the incremental information content existing between pairwise measures. The best combination exists between CFO and NOPAT (adjusted- R^2= 82.01%). The lowest exists when NI is paired with EBEI (R^2=76.55%). One interesting result is that NI still has the ability to outperform EVA as its explanatory power increases by 0.67% when paired with NI.

One interesting finding is that the adjusted-R^2 obtained from the original return model by Biddle *et al.*, is similar to that of the extended version of the return model where the book value (BV) is introduced as a dependent variable. This might indicate that unlike the price model, the book value (BV) adds little to other variables information content. Moreover, the changes in earnings before extraordinary items (EBIT) have the highest adjusted- R^2(14.76%) when adopting the extended version of Biddle *et al.*, and earnings before interest depreciation and amortization (EBITDA) had the highest adjusted-R^2 (13.37%) when adopting the normal return model.

7.2.2 Findings for the main components of NI and EVA

The results obtained provide empirical evidence on the incremental information content of EVA and NI components with regard to explaining the variation in stock performances. All NI components are significant and positively associated with the share price performances at the 0.05 level except for ΔAP which has a significant and negative sign. In support of the incremental information content of NI components, there is strong evidence regarding the increases in adjusted-R^2 after decomposition into cash flows and accruals. It increases from 76.55% (for NI alone) to 82.70% (after decomposition). The increase in R^2 by 6.15% indicates that jointly, cash flow and accrual components significantly outperform NI in explaining changes in price performances. This is consistent with Wilson (1986 and 1987) and Garrod *et al.* (2000) who claim that decomposing NI (earnings) into main components, the cash flows and accruals, will enhance the model's ability to explain the stock performance's volatility.

Turning to EVA components the adjusted- R^2 has increased by 2.91% after the decomposition which indicates that EVA's components together significantly outperform EVA in explaining changes in price performances. The best results are achieved when accruals (ACCR) are separately paired with the capital charge (CAPCHG) and after tax interest (ATINT). Interestingly, the traditional performance measures still have the ability to compete and outperform the value added measures.

7.2.3 Findings for the effects of adopting economic value added (EVA)

The results that have been obtained after the application of the CAR and BHAR aggregation method indicate that firms adopting EVA as a compensation plan and management tool outperform the market (S&P500) and controlling firms (same sector) most of the time within the hold period. The CAR results show that despite the benchmarking used, the majority of adopter firms positively outperform the matching firms and the S&P500 portfolio and after a few months the adopter firms have a negative performance mainly in year one and year five of the ten year estimated period.

Regarding the BHAR approach the findings reveal that the results obtained from a comparison against the benchmarking portfolio (S&P500) are smaller in value than those obtained when compared to the matching firms' benchmark. One interesting finding is that CAR is almost the same as BHAR when the S&P500 portfolio is used as a benchmark to calculate the aggregate returns.

To sum up, regardless of the aggregation approach used to measure the abnormal return, the adopter firms have a considerably low outperformance and this outperformance increased as the hold period increased. However, even with the positive performances most EVA adopter firms' outperformance declines after the adoption and takes some time to return to negative performance when matching benchmarks are used. This might typically reflect the fact that the market might react poorly to the adoption announcement.

Although I have proposed three modified versions of Wallace (1997) to examine the long-term effects of adopting economic value added (EVA) compensation plan on top management investing decisions (e.g. asset disposition and new investment decisions), financing decisions (e.g. share repurchase and dividends decisions) and operating decisions (e.g. asset turnover, inventory turnover, AR turnover and AP turnover). The result shows that the adjusted-$\boldsymbol{R^2}$, of the modified versions used is quite high. Thus, my modified models are arguably better able to capture any significant effect in the EVA adopter firms' performances after the adoption date.

The results obtained from the Wallace model indicate that none of the firms' potential decisions is significantly affected by EVA adoption. In addition I contend that Wallace's model, where the market return index (S&P500) replaces the change in ownership as a control variable in Wallace's original model, was simply attempting to regress some control variables on dependent variables that are dominated by noise. The consistently low adjusted coefficients of determination confirm the suspicion that Wallace's regression is probably spurious.

For the second modified version, where variables are used in levels rather in differences, the adjusted-$\boldsymbol{R^2}$ is significantly improved for all decisions; only the new investment and asset turnovers are insignificant, the disposition and repurchases are the only decisions that are in agreement with Wallace's original model. The remaining variables, dividends and inventory decisions, are both significant and in opposite directions. The AP turnover is insignificant in both the original and the extended version model. Finally, the EVA adoption impact could be both negative and positive on dividends and AR turnover decisions.

Turning to the third model result, when applying the abnormal measures model (abnormal measures of dependent and independent variables) we expect the matching problem inherent in the levels model (the second modification of Wallace model) will be demolished. I note that the new investment decision is the only variable that matched Wallace's conclusion. The remaining decisions are significant but inconsistent with the direction of the Wallace model. However, the only insignificant variable is the disposition decision.

7.3 Research conclusion

With regard to the value relevance of selected performance measures, the general conclusion is that all the selected performance measures (in whatever way the evaluation model has been used) have a significant effect on the variation in stock return (price) performances. The CFO and EBITDA are superior among the investigated performance measures, particularly the value added measures (i.e. economic value added (EVA) and cash value added (CVA)). Two results are worth noting. First, there is strong UK evidence of the superiority of accruals in explaining changes in stock performances and its ability to increase the value relevancy of NI when the latter is decomposed into cash flows and main accruals components. Second, the cash value added (CVA) (the performance measure that is used the first time to address the UK data), is highly significant and has the ability to explain 76.0% of the variation in UK stock performances.

Regarding the incremental information content, all the performance measures in this research have incremental information beyond each other. The best compensation was between CFO and NOPAT. To this end it is better to use a combination of performance measures to examine firm performances.

In terms of decomposing, we conclude that decomposing NI into its main components, the cash flows and accruals, increases the explanatory power of the former and improves the quality of earnings. The increase in R^2 (6.15%) could be considered a good indicator of the quality of the earnings released by the UK firm. Similarly, there are some gains from decomposing EVA into its main components. The increases in adjusted R^2 (the explanatory power) and all the EVA components are significant at the conventional level.

In regard to the adoption of EVA as a performance incentive scheme and management tool effect this research concludes that EVA firms have outperformed the matching firms and the market portfolio S&P500 index through the holding periods but the market was weak in its response to the adoption announcement. In addition, the current research conclude that adopting EVA as a management tool significantly affects the adopting firm’s potential investment, financial and operating decisions. The new investment decision is the only one in the direction of Wallace (1997). In general, the results obtained regarding the long-term effects of EVA adoption are mixed regardless of the modified model applied.

7.4 Research contributions and recommendations

In order to draw attention to the main contributions of the current research, they were divided into two main aspects: the contribution to the United Kingdom literature, particularly the performance measures field, and the contribution to the US literature by testing the consequences and the effects of adopting economic value added (EVA) as a compensation scheme and as a management tool on firms' performances and management behaviour. Firstly, in the UK there is a lack of studies that examine the association between performance measures and the variation in stock price (return) performances in general. Therefore, this research will employ UK data for the period 1960 to 2012 and adopt a unified econometrics model to examine and test the association of a set of performance measures, (being the focus of past literature), and the variation in annual stock price performances. This, as intended, will eliminate the controversies embedded in the findings of previous UK studies regarding the use of different samples and econometric models in conducting their research.

In addition, the research will provide some statistical information about the value relevance of cash value added (CVA), the performance measures that are being used for the first time to examine UK data. Furthermore, the net income available to common (NI) and economic value added (EVA), the measures that are most vulnerable to criticism in the literature, are decomposed into their main items to test whether these components can convey more information about a firm's performance rather than the original measures.

Secondly, there will be a contribution to the US literature in terms of the modification I have done to Wallace's (1997) model design. In order to test the impact of adopting EVA as a performance incentive scheme and management tool on the performance of adopter firms the current research modified Wallace's work in three ways**.** First it is modified by replacing the change in ownership in Wallace's original model with the market return index (S&P500) as a control variable. Second, I proposed a model that uses variables in levels rather than differences. Third, a modified model is proposed that uses abnormal measures of dependent and independent variables.

Finally, based on the results of running our test against the proposed models, this study recommended that:

- Firms and investors in the UK should be familiar with the logical meaning of the economic value added (EVA) and cash value added (CVA) as new performance measures to evaluate managers' performances and the performances of firms listed in the London Stock Exchange Market. As seen early in chapter 5 (EVA adopter) there are five UK companies that have announced their adoption of the EVA concept.
- As different performance measures reveal incremental information beyond each other, investors again should not rely heavily on one performance measure to evaluate the top management and firm's performance, and the probability of there being no significant relationship holds between stock prices and what the financial statement contains This might refer to the fact that investors are unaware of the importance of these figures that are disclosed and what they mean. Consequently this study suggests that we should do our best to steer investor attentions towards the importance of these figures disclosed in financial statements and their ability to provide us with the best indicator about the intactness of firms' performances.

7.5 Research limitations

This study, as with much research, has a number of limitations. These limitations appeared during the different stages of the research. In the first stage, the stage of the formulation of the research's questions and its objectives, there was a scarcity of UK academic studies that investigated the association between stock market performance and different performance measures, and particularly studies that used the price model to discuss the aforementioned association. Furthermore, none of these studies discussed the association between cash value added (CVA) and stock price (return) performances.

In the second stage, that of data collection, there were many firms that had not released accounting and financial information (i.e. share price and firms' Betas) even though they were listed on the London Stock Exchange (LSE) since the 1960s or even before that.. Moreover, the mnemonic code that is used by the DataStream software engine as a firms' ID to trace all released accounting information in different time periods was different to that used by the LSE and other databases. The most difficult problem to address regarding the mnemonic code was that most firms (UK and US firms) have different mnemonic codes within the same data software (e.g. DataStream, CRSP and Compustat). The research attempted to deal with this limitation through the adoption of a firm's name (each time) to trace the accounting and financial information with a miscellaneous database. In addition I manually calculated some variables that would enable me to calculate the main variables of the study, such as the firm's Beta.

To sum up, regardless of the aforementioned limitations the current research achieved its objectives by providing a complete image of the value relevancy of the selected performance measures and successfully designed a modification model that best captures the consequences of adopting EVA regarding a managers' and firms' behaviour after the adoption.

Another possibly significant limitation is the change in the accounting standards that the British system experienced. Due to time limitations, the possible effect of the accounting standards change has not been addressed in this thesis. However, it would be interesting to extend the present research to include the move of the accounting standard from the UK-GAAP to IFRS.

This thesis focused on the US and the UK markets as case studies. This choice was driven partly by the fact that these countries have similar financial and accounting systems as well as being amongst the largest markets in the world. However, the results may not be generalised to other countries that have different accounting systems. Therefore, it may be useful to extend the present work to include other developed and developing markets for the purpose of assessing the various accounting measures in different accounting systems and financial environments.

One limitation related to the adoption of EVA by firms is the endogeneity inherent in the adoption of EVA. Specifically, firms that adopt EVA also adopt other changes within the firm. Therefore, the effect (or lack of it) of EVA adoption found in this study could be only partially due to EVA. However, the use of control firms to contrast them with the adopting or treatment firms has probably mitigated this effect.

7.6 Future research

Future studies should include replicating similar price and return evaluation models using different UK sectors to see whether these results regarding the value relevance of performance metrics continue to hold for UK data regardless of the sector in which the company operates. As already noted, the economic value added (EVA) has been calculated using the economic definition of EVA that is similar to the residual income (RI) concept mentioned early in the literature and which ignored the accounting adjustment recommended by Stern & Stewart Co. Therefore, in order to examine the value relevance of these accounting adjustments, it is suggested that the same research would likely apply to the UK accounting adjustments that have been applied to both net operating profits after tax (NOPAT) and the invested capital (IC).

Finally, the three models I have proposed to replace Wallace's (1997) original model are considered to be a platform and a starting point for any research conducted in the future into the impact of adopting EVA on managers' and firms' performances after the adoption date.

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Appendices

Appendix 1: Full 60 months event period for all cases

Summary statistics for adopter firm return

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.028	2.549	0.103	-0.266	0.376	0.347	1.679	-0.031	0.085
2	87	0.016	1.729	0.087	-0.161	0.444	1.962	7.116	-0.035	0.042
3	87	-0.007	-0.697	0.090	-0.284	0.332	0.401	2.201	-0.068	0.045
4	87	0.028	3.007	0.087	-0.281	0.235	0.124	1.395	-0.017	0.068
5	87	0.018	2.509	0.068	-0.145	0.230	0.281	0.717	-0.025	0.053
6	87	0.008	0.924	0.077	-0.177	0.208	0.283	0.129	-0.039	0.053
7	87	0.010	0.833	0.109	-0.215	0.324	0.363	0.331	-0.059	0.074
8	87	0.007	0.599	0.113	-0.469	0.343	-0.795	3.365	-0.040	0.073
9	87	0.015	1.615	0.087	-0.216	0.198	-0.278	-0.008	-0.033	0.070
10	87	0.002	0.252	0.075	-0.231	0.160	-0.382	0.537	-0.035	0.051
11	87	0.028	2.762	0.095	-0.214	0.300	0.260	0.649	-0.028	0.082
12	87	0.018	2.000	0.083	-0.188	0.260	-0.197	0.615	-0.030	0.066
13	87	0.004	0.380	0.105	-0.327	0.479	0.513	4.981	-0.048	0.054
14	87	0.035	3.460	0.094	-0.278	0.333	-0.342	2.329	-0.001	0.080
15	87	0.022	2.427	0.083	-0.164	0.280	0.324	0.395	-0.027	0.067
16	87	0.020	1.745	0.109	-0.291	0.647	2.309	12.548	-0.035	0.049
18	87	0.027	2.434	0.105	-0.273	0.484	1.296	4.925	-0.027	0.054
19	87	0.022	1.885	0.111	-0.210	0.521	1.466	4.889	-0.037	0.076
20	87	0.008	0.777	0.097	-0.320	0.358	0.126	2.394	-0.045	0.059
21	87	-0.002	-0.166	0.097	-0.396	0.275	-0.287	2.704	-0.052	0.054
22	87	-0.009	-0.925	0.088	-0.278	0.235	0.104	1.341	-0.058	0.040
23	87	0.047	4.563	0.096	-0.226	0.292	-0.259	0.141	-0.009	0.118
24	87	0.003	0.313	0.090	-0.247	0.220	-0.059	-0.145	-0.074	0.061
25	87	0.031	1.636	0.179	-0.543	1.200	3.270	22.470	-0.027	0.064
26	87	0.022	2.074	0.099	-0.206	0.403	0.769	2.926	-0.033	0.068
27	87	0.033	1.869	0.165	-0.407	0.934	2.592	12.668	-0.038	0.067
28	87	0.014	1.016	0.130	-0.308	0.631	1.122	5.422	-0.045	0.073
29	87	0.017	1.657	0.096	-0.280	0.316	-0.022	2.444	-0.036	0.065
30	87	0.005	0.509	0.087	-0.242	0.299	0.257	1.603	-0.038	0.063
31	87	-0.013	-1.157	0.106	-0.307	0.395	0.536	3.025	-0.066	0.043
32	87	-0.033	-2.527	0.120	-0.434	0.342	-0.521	1.906	-0.076	0.029
33	87	-0.014	-1.158	0.109	-0.473	0.237	-1.246	4.010	-0.050	0.049
34	87	0.008	0.690	0.110	-0.402	0.281	-0.478	1.829	-0.042	0.078
35	87	0.034	2.356	0.136	-0.487	0.495	-0.232	4.345	-0.033	0.094
36	87	0.019	1.613	0.109	-0.319	0.393	0.230	1.717	-0.044	0.081
37	87	0.049	2.609	0.176	-0.295	0.968	2.486	10.111	-0.033	0.082
38	87	-0.006	-0.491	0.107	-0.313	0.189	-0.503	0.060	-0.073	0.064
39	87	0.009	0.772	0.112	-0.243	0.329	0.508	0.880	-0.067	0.072
40	87	0.030	2.075	0.134	-0.192	0.600	2.189	6.450	-0.037	0.076
41	87	0.040	3.309	0.113	-0.187	0.607	1.722	6.799	-0.014	0.072
42	86	0.016	0.963	0.150	-0.520	0.609	0.447	3.843	-0.054	0.071
43	86	-0.006	-0.379	0.137	-0.385	0.728	1.398	9.621	-0.070	0.057
44	86	-0.021	-1.725	0.112	-0.436	0.251	-0.729	2.314	-0.080	0.041
45	86	0.000	0.019	0.146	-0.798	0.414	-1.782	10.485	-0.045	0.069
46	85	0.008	0.563	0.136	-0.265	0.545	0.847	2.155	-0.084	0.079
47	85	0.054	3.020	0.164	-0.395	0.821	1.447	5.582	-0.027	0.100
48	85	0.014	0.994	0.128	-0.265	0.391	0.351	1.198	-0.058	0.074
49	85	-0.003	-0.262	0.096	-0.257	0.375	0.844	3.273	-0.070	0.041
50	85	0.000	-0.016	0.134	-0.393	0.430	0.681	2.207	-0.077	0.065
51	85	0.003	0.239	0.109	-0.360	0.368	0.213	1.678	-0.078	0.065
52	85	0.052	4.204	0.114	-0.251	0.437	0.499	0.929	-0.020	0.121
53	85	0.022	1.769	0.115	-0.254	0.599	1.434	6.462	-0.041	0.073
54	85	0.017	1.299	0.120	-0.340	0.383	0.598	1.488	-0.060	0.061
55	84	-0.020	-1.268	0.143	-0.644	0.309	-1.241	5.425	-0.080	0.058
56	84	-0.032	-2.207	0.132	-0.536	0.315	-0.610	2.925	-0.094	0.021
57	84	-0.008	-0.809	0.095	-0.343	0.250	-0.232	1.994	-0.071	0.042
58	83	-0.009	-0.514	0.153	-0.811	0.311	-1.607	8.262	-0.078	0.076
59	82	0.028	1.632	0.154	-0.335	0.900	2.204	12.396	-0.035	0.075
60	82	0.006	0.432	0.118	-0.429	0.422	0.295	3.540	-0.052	0.048

Summary statistic for market returns (S&P500)

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.026	8.810	0.027	-0.069	0.132	-0.549	4.995	0.010	0.033
2	87	0.007	2.183	0.032	-0.092	0.070	0.051	0.333	-0.029	0.036
3	87	0.001	0.258	0.035	-0.064	0.097	-0.132	-0.921	-0.043	0.027
4	87	0.016	6.122	0.024	-0.031	0.077	0.007	0.186	0.009	0.028
5	87	0.020	7.852	0.024	-0.025	0.092	0.283	0.878	0.012	0.036
6	87	0.008	2.647	0.026	-0.048	0.054	0.124	-1.054	-0.017	0.023
7	87	0.010	2.434	0.039	-0.046	0.088	0.058	-0.883	-0.012	0.032
8	87	-0.006	-0.966	0.053	-0.146	0.061	-1.520	1.510	-0.024	0.034
9	87	0.016	3.766	0.039	-0.082	0.062	-0.315	-1.362	-0.027	0.054
10	87	0.014	3.499	0.038	-0.218	0.080	-2.402	15.396	-0.005	0.026
11	87	0.021	4.466	0.045	-0.085	0.075	-0.501	-1.055	-0.013	0.059
12	87	0.015	5.407	0.025	-0.022	0.112	0.899	1.989	0.010	0.017
13	87	0.028	9.606	0.027	-0.069	0.071	-1.441	3.024	0.024	0.041
14	87	0.010	2.757	0.033	-0.092	0.070	0.034	0.047	-0.020	0.036
15	87	0.007	1.519	0.040	-0.064	0.097	0.048	-0.686	-0.043	0.027
16	87	0.022	7.583	0.027	-0.061	0.077	-0.455	0.409	0.012	0.038
17	87	0.021	6.984	0.029	-0.025	0.092	-0.177	-0.751	0.004	0.036
18	87	0.016	5.375	0.029	-0.072	0.054	-0.726	-0.028	0.002	0.043
19	87	0.014	3.004	0.044	-0.079	0.088	0.037	-1.098	-0.016	0.032
20	87	-0.015	-2.534	0.055	-0.146	0.061	-1.121	0.626	-0.057	0.019
21	87	0.020	4.491	0.042	-0.110	0.062	-0.877	-0.375	-0.027	0.053
22	87	0.013	3.571	0.035	-0.034	0.086	0.453	-0.536	-0.005	0.026
23	87	0.027	5.845	0.043	-0.080	0.075	-1.055	0.072	0.018	0.059
24	87	0.018	5.871	0.028	-0.060	0.112	0.680	1.983	0.010	0.017
25	87	0.023	6.738	0.031	-0.069	0.071	-1.151	1.137	0.010	0.041
26	87	0.010	2.206	0.040	-0.092	0.070	-0.245	0.184	-0.020	0.036
27	87	0.015	3.205	0.043	-0.064	0.097	-0.110	-0.583	-0.022	0.050
28	87	0.022	7.145	0.029	-0.061	0.081	-0.186	0.224	0.009	0.038
29	87	0.013	4.073	0.031	-0.025	0.092	0.250	-1.052	-0.019	0.036
30	87	0.019	6.666	0.027	-0.072	0.054	-0.837	0.392	0.002	0.039
31	87	0.003	0.548	0.043	-0.079	0.088	0.573	-0.800	-0.032	0.032
32	87	-0.029	-4.131	0.066	-0.146	0.061	-0.700	-0.711	-0.057	0.019
33	87	0.021	3.964	0.048	-0.110	0.062	-0.940	-0.524	-0.027	0.054
34	87	0.023	5.489	0.039	-0.034	0.086	0.163	-1.123	-0.005	0.063
35	87	0.035	7.383	0.044	-0.080	0.075	-1.570	1.542	0.019	0.060
36	87	0.019	5.819	0.031	-0.060	0.112	0.180	-0.155	0.004	0.056
37	87	0.023	6.415	0.034	-0.069	0.061	-1.074	0.473	0.010	0.041
38	87	-0.001	-0.262	0.043	-0.092	0.070	-0.083	0.105	-0.032	0.009
39	87	0.014	2.784	0.047	-0.064	0.097	-0.147	-0.873	-0.043	0.039
40	87	0.023	6.019	0.036	-0.061	0.081	-0.540	-0.286	0.009	0.058
41	87	0.009	2.596	0.033	-0.025	0.092	0.534	-1.114	-0.022	0.036
42	87	0.022	6.101	0.033	-0.072	0.054	-1.265	1.074	0.002	0.043
43	87	-0.001	-0.247	0.046	-0.079	0.078	0.682	-0.599	-0.032	0.032
44	87	-0.031	-4.710	0.061	-0.146	0.061	-0.580	-0.486	-0.057	0.018
45	87	0.005	0.787	0.056	-0.110	0.062	-0.489	-1.166	-0.029	0.054
46	87	0.026	5.796	0.042	-0.034	0.086	-0.070	-1.354	-0.005	0.063
47	87	0.033	7.032	0.044	-0.080	0.075	-1.581	1.777	0.019	0.059
48	87	0.022	6.048	0.033	-0.060	0.112	-0.329	0.171	0.006	0.056
49	87	0.009	2.309	0.037	-0.051	0.061	-0.407	-1.082	-0.018	0.041
50	87	-0.004	-0.727	0.046	-0.092	0.070	0.158	-0.272	-0.030	0.010
51	87	0.025	4.629	0.051	-0.064	0.097	-0.339	-0.876	-0.018	0.050
52	87	0.015	3.349	0.042	-0.061	0.081	-0.136	-0.958	-0.031	0.048
53	87	0.000	0.103	0.029	-0.025	0.059	1.025	-0.435	-0.022	0.018
54	87	0.017	4.282	0.037	-0.072	0.054	-1.205	0.565	0.002	0.043
55	87	-0.008	-1.803	0.040	-0.079	0.078	0.724	0.545	-0.032	-0.011
56	87	-0.028	-3.644	0.071	-0.146	0.061	-0.530	-0.889	-0.064	0.019
57	87	-0.010	-1.659	0.059	-0.110	0.062	-0.048	-1.345	-0.053	0.053
58	87	0.033	7.478	0.042	-0.034	0.086	-0.181	-1.404	-0.005	0.080
59	87	0.020	3.468	0.054	-0.080	0.075	-1.003	-0.463	0.007	0.059
60	87	0.022	5.637	0.036	-0.060	0.112	-0.558	0.221	0.004	0.056

Market benchmark based abnormal return

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.003	0.222	0.106	-0.276	0.366	0.356	1.531	-0.052	0.058
2	87	0.009	1.000	0.081	-0.131	0.374	1.858	5.855	-0.037	0.029
3	87	-0.008	-0.872	0.082	-0.292	0.293	0.165	2.536	-0.050	0.035
4	87	0.012	1.343	0.086	-0.270	0.225	0.343	1.038	-0.042	0.056
5	87	-0.002	-0.294	0.065	-0.158	0.255	0.928	3.072	-0.035	0.026
6	87	0.000	0.015	0.074	-0.157	0.186	0.343	0.150	-0.045	0.042
7	87	0.000	-0.035	0.098	-0.182	0.306	0.494	1.003	-0.056	0.055
8	87	0.013	1.198	0.100	-0.323	0.324	0.207	2.155	-0.037	0.056
9	87	-0.001	-0.086	0.080	-0.199	0.183	-0.323	0.192	-0.055	0.048
10	87	-0.012	-1.357	0.084	-0.226	0.269	-0.085	0.895	-0.055	0.043
11	87	0.007	0.747	0.086	-0.255	0.259	0.107	1.254	-0.035	0.048
12	87	0.003	0.352	0.085	-0.246	0.242	-0.175	0.947	-0.041	0.058
13	87	-0.024	-2.312	0.097	-0.276	0.438	0.915	5.199	-0.085	0.030
14	87	0.025	2.526	0.092	-0.285	0.297	-0.177	2.136	-0.023	0.071
15	87	0.015	1.828	0.077	-0.170	0.187	0.025	-0.199	-0.040	0.062
16	87	-0.001	-0.111	0.109	-0.303	0.609	2.219	11.310	-0.067	0.038
17	87	0.004	0.491	0.083	-0.238	0.252	0.118	1.260	-0.041	0.053
18	87	0.011	0.988	0.103	-0.313	0.429	0.832	3.849	-0.040	0.053
19	87	0.008	0.801	0.096	-0.175	0.489	1.898	6.995	-0.047	0.044
20	87	0.023	2.477	0.087	-0.174	0.359	0.490	2.191	-0.032	0.072
21	87	-0.022	-2.196	0.094	-0.367	0.222	-0.219	1.531	-0.077	0.032
22	87	-0.022	-2.110	0.098	-0.358	0.217	-0.432	1.630	-0.073	0.048
23	87	0.020	1.957	0.095	-0.187	0.281	0.281	0.087	-0.046	0.068
24	87	-0.015	-1.395	0.099	-0.303	0.242	-0.244	0.158	-0.080	0.049
25	87	0.009	0.439	0.187	-0.554	1.251	3.507	23.579	-0.050	0.043
26	87	0.012	1.173	0.098	-0.276	0.423	0.690	3.402	-0.037	0.061
27	87	0.018	1.052	0.161	-0.504	0.926	2.237	13.271	-0.045	0.051
28	87	-0.008	-0.594	0.126	-0.282	0.617	1.461	6.553	-0.074	0.059
29	87	0.004	0.380	0.090	-0.258	0.328	0.540	3.362	-0.042	0.048
30	87	-0.015	-1.531	0.089	-0.297	0.259	0.038	1.378	-0.071	0.034
31	87	-0.016	-1.437	0.102	-0.276	0.318	0.413	2.032	-0.069	0.031
32	87	-0.003	-0.326	0.094	-0.288	0.323	-0.067	1.898	-0.049	0.051
33	87	-0.034	-3.137	0.101	-0.419	0.174	-1.099	3.330	-0.079	0.030
34	87	-0.015	-1.354	0.102	-0.397	0.201	-0.505	1.479	-0.073	0.048
35	87	-0.001	-0.071	0.116	-0.407	0.436	0.323	4.137	-0.068	0.046
36	87	0.000	-0.020	0.112	-0.375	0.375	-0.045	1.683	-0.056	0.062
37	87	0.026	1.374	0.177	-0.336	0.933	2.242	9.183	-0.046	0.063
38	87	-0.004	-0.410	0.100	-0.319	0.250	-0.117	0.811	-0.051	0.046
39	87	-0.005	-0.424	0.103	-0.251	0.256	0.011	0.584	-0.056	0.050
40	87	0.006	0.450	0.132	-0.251	0.523	1.629	4.550	-0.060	0.046
41	87	0.031	2.621	0.110	-0.165	0.632	2.155	9.971	-0.021	0.068
42	86	-0.006	-0.356	0.153	-0.495	0.634	0.629	3.805	-0.075	0.050
43	86	-0.003	-0.243	0.132	-0.374	0.739	1.807	11.544	-0.065	0.051
44	86	0.010	0.922	0.100	-0.290	0.308	-0.028	1.510	-0.038	0.053
45	86	-0.004	-0.270	0.132	-0.745	0.361	-1.858	11.344	-0.052	0.051
46	85	-0.019	-1.379	0.128	-0.244	0.527	0.974	2.818	-0.105	0.064
47	85	0.021	1.244	0.155	-0.315	0.746	1.544	5.396	-0.061	0.061
48	85	-0.008	-0.581	0.128	-0.314	0.387	0.195	1.161	-0.070	0.054
49	85	-0.012	-1.139	0.097	-0.274	0.340	0.978	2.955	-0.065	0.016
50	85	0.005	0.353	0.134	-0.372	0.450	0.875	2.491	-0.079	0.063
51	85	-0.022	-1.806	0.112	-0.396	0.271	-0.503	0.962	-0.094	0.048
52	85	0.037	2.833	0.120	-0.328	0.399	0.406	1.003	-0.037	0.075
53	85	0.021	1.763	0.111	-0.235	0.594	1.648	7.204	-0.057	0.081
54	85	0.001	0.049	0.121	-0.380	0.359	0.437	1.161	-0.070	0.072
55	84	-0.012	-0.859	0.130	-0.565	0.293	-1.462	5.792	-0.070	0.054
56	84	-0.006	-0.431	0.128	-0.482	0.261	-1.003	3.953	-0.055	0.057
57	84	0.003	0.329	0.091	-0.290	0.278	0.010	0.834	-0.053	0.064
58	83	-0.041	-2.509	0.150	-0.829	0.272	-1.724	8.354	-0.113	0.041
59	82	0.008	0.488	0.148	-0.342	0.825	2.024	10.768	-0.063	0.053
60	82	-0.016	-1.170	0.121	-0.368	0.418	0.575	2.300	-0.080	0.026

Summary statistic for matching firms return

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.005	0.535	0.078	-0.302	0.260	-0.246	3.375	-0.035	0.039
2	87	0.012	0.780	0.145	-0.297	1.006	3.703	25.593	-0.047	0.054
3	87	0.000	-0.014	0.117	-0.611	0.430	-1.728	11.232	-0.023	0.048
4	87	0.024	2.301	0.097	-0.167	0.372	0.957	1.599	-0.029	0.064
5	87	0.000	-0.031	0.108	-0.263	0.497	1.211	5.151	-0.043	0.036
6	87	0.014	1.450	0.090	-0.250	0.311	0.452	1.768	-0.034	0.058
7	87	0.038	3.028	0.118	-0.206	0.556	1.894	5.809	-0.021	0.076
8	87	0.022	1.511	0.136	-0.313	0.914	3.418	21.616	-0.020	0.047
9	87	0.015	1.871	0.074	-0.176	0.226	-0.102	0.668	-0.025	0.061
10	87	0.002	0.172	0.089	-0.247	0.502	1.808	11.220	-0.037	0.035
11	87	0.001	0.111	0.081	-0.396	0.145	-1.529	5.858	-0.022	0.051
12	87	0.024	2.490	0.089	-0.438	0.269	-1.077	8.266	-0.012	0.064
13	87	0.017	1.905	0.085	-0.143	0.311	0.982	1.526	-0.027	0.062
14	87	-0.008	-0.713	0.111	-0.382	0.350	-0.094	2.230	-0.064	0.046
15	87	-0.001	-0.072	0.115	-0.244	0.571	1.149	6.240	-0.058	0.044
16	87	0.031	3.262	0.087	-0.175	0.329	0.362	1.250	-0.013	0.083
17	87	0.019	1.394	0.128	-0.392	0.583	0.569	4.594	-0.041	0.068
18	87	0.018	2.008	0.084	-0.231	0.238	0.020	0.809	-0.035	0.073
19	87	0.025	2.112	0.111	-0.400	0.514	0.884	6.542	-0.017	0.057
20	87	0.001	0.110	0.104	-0.200	0.514	1.957	7.594	-0.061	0.035
21	87	0.044	2.251	0.182	-0.184	1.500	6.138	48.676	-0.016	0.079
22	87	-0.001	-0.125	0.107	-0.267	0.439	0.971	3.185	-0.063	0.045
23	87	0.021	1.797	0.109	-0.201	0.545	1.576	5.896	-0.042	0.052
24	87	0.014	1.464	0.091	-0.357	0.249	-0.568	3.281	-0.033	0.068
25	87	0.000	0.047	0.087	-0.256	0.154	-0.848	0.686	-0.023	0.049
26	87	-0.008	-0.805	0.094	-0.388	0.195	-1.191	3.455	-0.039	0.051
27	87	-0.011	-0.922	0.114	-0.439	0.337	-0.408	2.640	-0.059	0.040
28	87	0.013	1.188	0.104	-0.272	0.383	0.546	2.365	-0.027	0.064
29	87	0.011	0.817	0.129	-0.395	0.406	-0.357	2.738	-0.027	0.073
30	87	0.017	1.759	0.089	-0.244	0.252	0.011	0.829	-0.026	0.062
31	87	0.020	1.611	0.113	-0.306	0.623	1.682	9.072	-0.026	0.072
32	87	0.014	1.178	0.114	-0.206	0.385	0.574	0.999	-0.051	0.065
33	87	0.004	0.418	0.094	-0.179	0.415	0.977	3.401	-0.049	0.046
34	87	0.025	1.003	0.234	-0.224	2.000	7.133	60.273	-0.044	0.044
35	87	0.036	2.628	0.127	-0.228	0.604	1.986	7.062	-0.019	0.076
36	87	0.013	1.289	0.096	-0.251	0.338	0.753	2.362	-0.041	0.062
37	87	0.008	0.646	0.119	-0.318	0.352	0.100	1.359	-0.036	0.071
38	87	-0.019	-1.827	0.097	-0.264	0.283	-0.244	0.999	-0.064	0.030
39	87	-0.004	-0.363	0.100	-0.241	0.375	0.986	2.589	-0.058	0.030
40	87	0.005	0.422	0.115	-0.304	0.331	0.778	2.091	-0.048	0.029
41	87	0.012	1.383	0.084	-0.188	0.356	0.594	2.499	-0.030	0.050
42	87	0.072	1.876	0.358	-0.317	3.227	8.100	71.735	0.000	0.089
43	87	0.014	1.193	0.108	-0.244	0.306	0.176	0.795	-0.034	0.063
44	87	0.009	0.498	0.164	-0.421	0.647	1.394	4.242	-0.074	0.046
45	87	0.015	0.718	0.196	-0.304	1.406	4.739	30.777	-0.059	0.035
46	87	0.008	0.507	0.143	-0.509	0.680	0.874	6.899	-0.040	0.052
47	87	0.032	2.771	0.109	-0.298	0.367	0.503	1.560	-0.022	0.074
48	87	0.031	2.106	0.137	-0.216	0.773	2.635	11.500	-0.028	0.058
49	87	0.015	1.314	0.103	-0.286	0.485	1.074	4.960	-0.040	0.048
50	87	0.014	1.090	0.117	-0.286	0.596	1.291	6.501	-0.039	0.068
51	87	0.007	0.575	0.107	-0.282	0.344	0.506	1.475	-0.038	0.036
52	87	-0.025	-2.161	0.108	-0.412	0.250	-0.587	2.089	-0.074	0.025
53	87	-0.004	-0.378	0.103	-0.488	0.223	-1.418	5.534	-0.034	0.048
54	87	0.010	0.920	0.097	-0.234	0.393	0.972	3.520	-0.032	0.042
55	86	0.003	0.236	0.099	-0.261	0.310	0.523	1.764	-0.053	0.039
56	86	0.014	1.144	0.112	-0.197	0.567	1.898	7.247	-0.045	0.049
57	86	-0.001	-0.098	0.125	-0.382	0.395	0.065	2.282	-0.050	0.038
58	86	0.014	1.393	0.094	-0.291	0.407	0.610	3.651	-0.041	0.068
59	85	0.025	2.504	0.093	-0.180	0.306	0.450	0.741	-0.024	0.082
60	85	0.006	0.604	0.094	-0.270	0.283	0.086	1.305	-0.032	0.055

Matching firm based abnormal returns (AR)

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th	75th
1	87	0.024	1.599	0.138	-0.259	0.565	1.104	3.605	-0.061	0.084
2	87	0.004	0.233	0.159	-0.761	0.530	-0.685	6.788	-0.046	0.063
3	87	-0.007	-0.453	0.134	-0.360	0.509	0.711	2.756	-0.068	0.045
4	87	0.004	0.310	0.122	-0.305	0.401	0.288	0.763	-0.090	0.090
5	87	0.019	1.443	0.120	-0.403	0.318	-0.513	1.788	-0.045	0.091
6	87	-0.006	-0.514	0.115	-0.380	0.233	-0.504	0.659	-0.075	0.074
7	87	-0.029	-1.849	0.144	-0.601	0.324	-0.479	2.117	-0.123	0.052
8	87	-0.015	-0.703	0.196	-1.190	0.302	-3.336	17.218	-0.052	0.076
9	87	0.000	0.020	0.110	-0.271	0.263	-0.071	-0.176	-0.084	0.074
10	87	0.000	0.030	0.120	-0.561	0.291	-0.960	4.838	-0.057	0.054
11	87	0.027	2.337	0.109	-0.207	0.347	0.744	0.764	-0.041	0.066
12	87	-0.006	-0.419	0.131	-0.416	0.531	-0.179	4.303	-0.049	0.057
13	87	-0.013	-1.131	0.107	-0.361	0.233	-0.543	1.182	-0.071	0.051
14	87	0.043	2.627	0.153	-0.402	0.404	-0.180	0.374	-0.041	0.147
15	87	0.022	1.619	0.130	-0.326	0.389	0.078	0.830	-0.056	0.088
16	87	-0.010	-0.662	0.143	-0.343	0.553	0.740	2.201	-0.074	0.064
17	87	0.007	0.374	0.165	-0.789	0.425	-1.095	5.212	-0.071	0.119
18	87	0.009	0.656	0.133	-0.377	0.431	0.214	1.075	-0.067	0.083
19	87	-0.003	-0.164	0.156	-0.494	0.479	0.142	2.219	-0.084	0.076
20	87	0.007	0.514	0.125	-0.412	0.335	-0.397	1.247	-0.059	0.072
21	87	-0.046	-2.077	0.205	-1.546	0.235	-4.755	33.449	-0.094	0.053
22	87	-0.007	-0.473	0.143	-0.505	0.263	-0.733	1.358	-0.074	0.071
23	87	0.026	1.823	0.132	-0.442	0.334	-0.341	1.044	-0.062	0.100
24	87	-0.011	-0.900	0.117	-0.295	0.286	-0.079	-0.205	-0.092	0.071
25	87	0.031	1.492	0.193	-0.586	1.096	1.886	10.732	-0.071	0.102
26	87	0.030	2.271	0.123	-0.315	0.442	0.525	2.012	-0.043	0.082
27	87	0.044	2.221	0.186	-0.345	0.934	1.475	5.798	-0.047	0.135
28	87	0.001	0.050	0.167	-0.479	0.631	0.452	2.678	-0.103	0.094
29	87	0.006	0.355	0.150	-0.442	0.391	-0.044	0.909	-0.086	0.078
30	87	-0.012	-0.887	0.126	-0.364	0.328	-0.328	0.815	-0.049	0.070
31	87	-0.033	-2.186	0.140	-0.585	0.445	-0.093	3.718	-0.101	0.034
32	87	-0.047	-2.785	0.157	-0.588	0.342	-0.857	1.392	-0.117	0.061
33	87	-0.018	-1.159	0.143	-0.473	0.316	-0.915	2.029	-0.069	0.062
34	87	-0.017	-0.632	0.252	-1.926	0.421	-5.049	38.721	-0.089	0.106
35	87	-0.001	-0.075	0.173	-0.615	0.546	-0.571	3.054	-0.071	0.079
36	87	0.006	0.377	0.139	-0.409	0.358	-0.387	0.768	-0.074	0.092
37	87	0.041	1.853	0.207	-0.493	0.968	1.144	4.721	-0.055	0.111
38	87	0.013	0.834	0.149	-0.323	0.335	-0.167	-0.410	-0.079	0.113
39	87	0.013	0.809	0.152	-0.554	0.333	-0.536	1.545	-0.068	0.109
40	87	0.025	1.339	0.171	-0.314	0.696	1.456	3.667	-0.070	0.076
41	87	0.028	1.739	0.149	-0.543	0.685	0.671	5.823	-0.046	0.077
42	86	-0.057	-1.385	0.384	-3.144	0.682	-6.126	50.025	-0.110	0.065
43	86	-0.020	-1.184	0.159	-0.385	0.644	0.723	2.696	-0.105	0.060
44	86	-0.026	-1.321	0.185	-0.684	0.491	-0.799	2.885	-0.095	0.057
45	86	-0.014	-0.505	0.249	-1.406	0.532	-2.736	12.373	-0.061	0.118
46	85	0.001	0.066	0.188	-0.594	0.509	-0.179	1.148	-0.119	0.120
47	85	0.020	0.975	0.185	-0.490	0.821	1.196	4.294	-0.074	0.106
48	85	-0.019	-0.892	0.192	-0.809	0.442	-1.386	4.719	-0.061	0.101
49	85	-0.018	-1.112	0.150	-0.560	0.399	-0.198	2.153	-0.087	0.060
50	85	-0.014	-0.784	0.167	-0.637	0.411	-0.330	1.971	-0.096	0.064
51	85	-0.007	-0.452	0.153	-0.448	0.354	-0.470	1.557	-0.086	0.078
52	85	0.078	4.579	0.158	-0.246	0.583	0.612	0.774	-0.017	0.165
53	85	0.024	1.443	0.150	-0.325	0.536	0.729	1.273	-0.076	0.098
54	85	0.011	0.706	0.149	-0.487	0.365	-0.258	1.267	-0.057	0.089
55	84	-0.021	-1.174	0.167	-0.660	0.432	-0.644	3.457	-0.077	0.040
56	84	-0.048	-2.641	0.166	-0.643	0.299	-0.871	1.714	-0.143	0.046
57	84	-0.007	-0.488	0.134	-0.450	0.403	-0.189	1.329	-0.071	0.078
58	83	-0.026	-1.354	0.174	-0.851	0.444	-1.224	6.419	-0.114	0.061
59	82	0.004	0.214	0.160	-0.331	0.823	1.348	7.517	-0.085	0.080
60	82	0.003	0.178	0.145	-0.429	0.421	0.207	0.865	-0.084	0.083

Summary Statistic for BH: EVA adopter BH returns

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.028	2.549	0.103	-0.266	0.376	0.347	1.679	-0.031	0.085
2	87	0.043	3.186	0.126	-0.182	0.615	1.390	4.499	-0.053	0.102
3	87	0.037	2.087	0.164	-0.336	0.808	1.611	6.259	-0.057	0.112
4	87	0.066	3.110	0.197	-0.333	0.912	1.870	6.594	-0.046	0.163
5	87	0.088	3.555	0.230	-0.378	1.352	2.116	10.178	-0.051	0.193
6	87	0.096	3.490	0.256	-0.327	1.560	2.625	12.744	-0.046	0.186
7	87	0.105	3.488	0.282	-0.382	1.536	2.198	8.461	-0.054	0.191
8	87	0.111	3.573	0.291	-0.469	1.108	1.104	2.413	-0.065	0.239
9	87	0.124	3.860	0.299	-0.438	1.258	1.351	3.205	-0.086	0.260
10	87	0.130	3.610	0.335	-0.500	1.603	1.724	5.188	-0.097	0.254
11	87	0.160	4.010	0.373	-0.391	2.125	2.320	9.259	-0.063	0.291
12	87	0.183	4.297	0.398	-0.491	2.329	2.173	9.092	-0.065	0.344
13	87	0.196	3.573	0.511	-0.509	3.922	4.603	32.534	-0.061	0.349
14	87	0.237	4.105	0.538	-0.419	4.031	4.238	28.366	-0.037	0.406
15	87	0.268	4.121	0.606	-0.485	4.641	4.617	31.271	-0.027	0.434
16	87	0.279	4.543	0.574	-0.378	4.166	4.081	24.532	0.003	0.433
17	87	0.311	5.009	0.580	-0.344	3.936	3.417	17.727	0.000	0.444
18	87	0.371	4.269	0.810	-0.422	6.322	5.139	34.688	0.014	0.501
19	87	0.417	4.148	0.939	-0.438	7.095	5.007	31.622	0.056	0.439
20	87	0.417	4.367	0.891	-0.438	6.634	4.706	28.838	0.054	0.480
21	87	0.408	4.638	0.821	-0.484	5.725	3.871	21.006	-0.002	0.572
22	87	0.388	4.724	0.767	-0.537	5.047	3.320	16.077	-0.002	0.542
23	87	0.453	5.047	0.837	-0.589	5.780	3.634	19.158	0.005	0.574
24	87	0.461	5.285	0.814	-0.636	4.451	2.531	8.220	-0.005	0.530
25	87	0.498	5.305	0.875	-0.637	4.353	2.631	8.206	0.009	0.616
26	87	0.540	5.315	0.948	-0.708	4.925	2.818	9.613	0.044	0.682
27	87	0.675	4.090	1.540	-0.725	10.147	4.436	22.867	0.059	0.681
28	87	0.749	3.355	2.082	-0.738	17.176	6.343	46.911	0.074	0.732
29	87	0.775	3.307	2.187	-0.752	18.886	6.965	56.093	0.112	0.819
30	87	0.749	3.773	1.851	-0.763	15.118	5.952	43.263	0.072	0.835
31	87	0.679	4.297	1.475	-0.774	10.176	4.339	23.159	0.080	0.827
32	87	0.639	3.493	1.705	-0.744	14.000	6.078	45.044	0.035	0.732
33	87	0.660	3.101	1.985	-0.865	16.882	6.728	53.215	-0.004	0.764
34	87	0.619	3.652	1.582	-0.919	12.882	5.784	42.574	-0.045	0.751
35	87	0.682	3.485	1.826	-0.952	15.824	6.859	56.049	0.016	0.843
36	87	0.729	3.583	1.899	-0.943	16.118	6.461	50.980	0.008	0.922
37	87	0.787	3.687	1.992	-0.887	16.765	6.326	48.976	-0.002	0.936
38	87	0.715	4.519	1.475	-0.915	11.206	4.643	29.900	-0.009	1.066
39	87	0.733	4.627	1.477	-0.927	10.941	4.358	26.717	0.001	1.057
40	87	0.788	4.465	1.645	-0.927	12.625	4.812	31.386	-0.013	1.034
41	87	0.840	4.578	1.712	-0.913	13.706	5.279	37.324	-0.024	1.101
42	86	0.915	4.119	2.060	-0.958	17.000	5.937	44.375	0.003	1.097
43	86	0.917	4.245	2.004	-0.974	15.934	5.372	37.590	-0.052	1.093
44	86	0.918	3.596	2.368	-0.975	20.177	6.594	52.404	-0.029	1.030
45	86	1.023	2.948	3.217	-0.984	28.941	7.877	68.521	-0.124	1.127
46	85	0.992	3.606	2.536	-0.986	21.353	6.407	50.264	-0.131	1.209
47	85	1.069	4.382	2.249	-0.975	16.471	4.436	26.593	-0.111	1.279
48	85	1.095	4.857	2.079	-0.980	12.118	3.031	11.674	-0.092	1.328
49	85	1.079	4.543	2.189	-0.974	14.412	3.654	17.713	-0.109	1.292
50	85	1.114	4.441	2.312	-0.976	16.177	3.920	21.454	-0.141	1.280
51	85	1.096	4.540	2.227	-0.980	15.471	3.805	20.627	-0.156	1.368
52	85	1.166	4.868	2.208	-0.980	15.294	3.691	19.723	-0.115	1.496
53	85	1.152	5.147	2.063	-0.980	13.353	3.160	14.381	-0.118	1.371
54	85	1.175	5.664	1.913	-0.980	8.471	1.994	4.148	-0.117	1.490
55	84	1.171	5.685	1.888	-0.981	8.192	1.844	3.377	-0.039	1.488
56	84	1.109	5.366	1.893	-0.985	8.604	2.143	5.107	-0.047	1.487
57	84	1.114	5.419	1.885	-0.985	8.706	1.970	4.402	-0.088	1.437
58	83	1.065	5.506	1.763	-0.997	7.971	1.805	3.501	-0.046	1.657
59	82	1.074	5.772	1.684	-0.995	6.529	1.565	2.191	-0.021	1.719
60	82	1.063	5.902	1.631	-0.993	6.221	1.437	1.593	-0.008	1.647

Summary Statistic for BH: Match firm BH returns

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.005	0.535	0.078	-0.302	0.260	-0.246	3.375	-0.035	0.039
2	87	0.016	0.980	0.156	-0.510	0.888	1.691	11.473	-0.068	0.071
3	87	0.013	0.748	0.167	-0.671	0.386	-1.068	3.828	-0.044	0.111
4	87	0.041	1.796	0.211	-0.648	0.605	-0.362	1.706	-0.040	0.148
5	87	0.036	1.532	0.222	-0.607	0.683	-0.115	1.641	-0.051	0.159
6	87	0.046	1.944	0.221	-0.638	0.606	-0.150	1.135	-0.058	0.159
7	87	0.088	3.194	0.256	-0.673	0.753	-0.103	1.268	-0.011	0.219
8	87	0.097	3.626	0.248	-0.476	0.903	0.509	1.352	-0.011	0.238
9	87	0.113	4.007	0.263	-0.539	0.898	0.409	1.102	0.000	0.259
10	87	0.115	3.846	0.280	-0.584	1.019	0.406	1.120	0.000	0.258
11	87	0.116	3.782	0.286	-0.593	0.790	0.058	0.208	-0.014	0.249
12	87	0.148	4.267	0.323	-0.710	0.943	0.128	0.334	0.000	0.327
13	87	0.165	4.563	0.337	-0.661	1.255	0.317	0.744	0.000	0.354
14	87	0.151	4.048	0.349	-0.710	1.165	0.448	0.592	-0.016	0.314
15	87	0.151	3.765	0.373	-0.758	1.167	0.658	1.108	-0.044	0.307
16	87	0.190	4.411	0.403	-0.726	1.379	0.495	0.762	0.000	0.361
17	87	0.205	4.695	0.407	-0.790	1.250	0.468	0.597	0.000	0.374
18	87	0.231	4.931	0.436	-0.839	1.563	0.621	1.004	0.000	0.426
19	87	0.269	5.341	0.471	-0.903	1.690	0.533	0.639	0.000	0.513
20	87	0.265	5.315	0.465	-0.903	1.477	0.522	0.593	0.000	0.515
21	87	0.300	5.770	0.484	-0.758	1.713	0.621	0.551	0.000	0.540
22	87	0.300	5.413	0.516	-0.823	2.306	1.036	2.360	0.000	0.480
23	87	0.323	5.370	0.561	-0.726	3.021	1.589	5.472	0.000	0.468
24	87	0.337	5.906	0.533	-0.742	1.976	0.693	0.644	0.000	0.596
25	87	0.337	5.775	0.545	-0.742	2.348	0.854	1.546	0.000	0.638
26	87	0.329	5.338	0.575	-0.742	3.000	1.296	4.377	0.000	0.642
27	87	0.311	4.946	0.587	-0.742	3.019	1.359	4.378	0.000	0.580
28	87	0.336	4.938	0.634	-0.742	2.952	1.334	3.094	0.000	0.635
29	87	0.351	4.994	0.655	-0.780	2.874	1.235	2.535	-0.004	0.653
30	87	0.376	5.216	0.673	-0.796	2.758	1.031	1.447	0.000	0.733
31	87	0.424	5.204	0.761	-0.845	3.082	1.136	1.425	-0.023	0.843
32	87	0.435	5.200	0.781	-0.832	3.107	1.170	1.283	0.000	0.757
33	87	0.449	5.105	0.820	-0.814	3.205	1.217	1.515	-0.050	0.832
34	87	0.465	5.156	0.841	-0.838	3.684	1.303	1.902	-0.049	0.812
35	87	0.516	5.347	0.900	-0.842	3.909	1.475	2.662	-0.025	0.999
36	87	0.510	5.574	0.853	-0.788	3.798	1.349	2.206	-0.030	1.032
37	87	0.515	5.738	0.837	-0.793	3.190	1.090	1.060	-0.037	1.139
38	87	0.463	5.658	0.763	-0.787	2.940	0.947	0.819	-0.050	0.893
39	87	0.450	5.575	0.754	-0.810	2.694	0.917	0.586	-0.012	0.962
40	87	0.450	5.648	0.744	-0.826	2.543	0.819	0.303	-0.039	0.972
41	87	0.466	5.641	0.771	-0.803	2.923	0.947	0.763	-0.023	0.998
42	87	0.561	5.790	0.903	-0.780	4.504	1.442	3.389	0.000	1.202
43	87	0.570	6.051	0.878	-0.742	3.367	1.033	0.846	-0.016	0.923
44	87	0.567	5.900	0.896	-0.742	3.580	1.220	1.512	-0.007	0.956
45	87	0.615	5.215	1.099	-0.742	6.543	2.379	9.168	0.000	0.909
46	87	0.644	4.132	1.455	-0.743	11.669	5.288	38.386	0.000	0.989
47	87	0.656	5.249	1.166	-0.765	7.888	3.138	16.464	0.000	1.138
48	87	0.756	4.000	1.764	-0.742	14.755	6.048	46.662	0.000	1.054
49	87	0.781	4.433	1.642	-0.742	12.989	5.077	35.541	0.000	1.221
50	87	0.816	4.277	1.780	-0.742	13.954	5.135	35.109	0.000	1.087
51	87	0.813	4.325	1.753	-0.742	13.600	5.011	33.571	0.000	1.044
52	87	0.793	3.944	1.876	-0.848	14.873	5.381	37.600	0.000	1.135
53	87	0.765	4.063	1.757	-0.848	14.056	5.320	38.137	0.000	1.038
54	87	0.787	3.719	1.973	-0.848	16.587	6.206	48.424	-0.026	1.060
55	86	0.871	3.378	2.392	-0.760	20.709	6.916	56.699	0.000	1.045
56	86	0.942	2.956	2.956	-0.742	26.357	7.675	65.914	0.000	1.080
57	86	0.886	3.171	2.590	-0.742	22.647	7.202	59.930	0.000	0.962
58	86	0.919	3.045	2.799	-0.742	24.881	7.582	64.746	0.000	1.023
59	85	0.994	3.043	3.013	-0.742	26.733	7.621	65.063	0.000	1.299
60	85	0.921	3.751	2.263	-0.742	19.239	6.512	51.889	0.000	1.255

Summary Statistic for BH: Market returns

Month	N	MEAN	t-stat	St. Dev.	Min	Max	Skewness	Kurtosis	25th Perc.	75th Perc.
1	87	0.026	8.810	0.027	-0.069	0.132	-0.549	4.995	0.010	0.033
2	87	0.033	7.900	0.039	-0.070	0.174	0.039	1.500	0.001	0.061
3	87	0.035	5.330	0.061	-0.121	0.205	0.071	-0.159	-0.032	0.076
4	87	0.051	7.271	0.065	-0.064	0.191	-0.052	-1.185	-0.005	0.118
5	87	0.072	9.583	0.070	-0.049	0.198	-0.067	-1.370	-0.004	0.145
6	87	0.081	8.222	0.092	-0.073	0.255	-0.144	-1.360	-0.016	0.177
7	87	0.092	7.947	0.109	-0.083	0.316	0.640	-1.043	0.017	0.224
8	87	0.084	8.061	0.097	-0.141	0.362	0.599	-0.300	0.019	0.214
9	87	0.102	7.944	0.120	-0.212	0.329	0.238	-0.641	0.002	0.265
10	87	0.116	10.300	0.105	-0.197	0.266	-0.335	-0.045	0.013	0.207
11	87	0.142	9.635	0.137	-0.137	0.318	-0.230	-1.378	0.003	0.237
12	87	0.158	10.559	0.140	-0.130	0.341	-0.203	-1.344	0.032	0.270
13	87	0.191	12.031	0.148	-0.144	0.385	-0.223	-1.380	0.052	0.319
14	87	0.202	12.310	0.153	-0.162	0.417	-0.077	-1.161	0.063	0.284
15	87	0.210	11.994	0.164	-0.210	0.487	0.100	-0.794	0.073	0.326
16	87	0.237	12.989	0.170	-0.184	0.501	-0.091	-1.011	0.103	0.376
17	87	0.262	14.522	0.168	-0.192	0.473	-0.331	-0.948	0.144	0.377
18	87	0.286	13.937	0.191	-0.250	0.531	-0.467	-0.837	0.168	0.437
19	87	0.303	14.480	0.195	-0.310	0.549	-0.430	-0.292	0.164	0.513
20	87	0.277	16.430	0.157	-0.306	0.460	-0.885	1.458	0.205	0.420
21	87	0.307	14.701	0.195	-0.382	0.538	-0.777	0.948	0.169	0.497
22	87	0.323	15.717	0.192	-0.329	0.536	-0.835	0.635	0.163	0.485
23	87	0.363	14.394	0.236	-0.291	0.648	-0.535	-0.678	0.119	0.551
24	87	0.387	15.172	0.238	-0.334	0.659	-0.689	-0.409	0.180	0.576
25	87	0.419	15.536	0.252	-0.352	0.728	-0.545	-0.272	0.193	0.592
26	87	0.435	15.109	0.269	-0.363	0.722	-0.560	-0.461	0.180	0.704
27	87	0.458	14.959	0.286	-0.358	0.789	-0.596	-0.490	0.183	0.737
28	87	0.489	15.585	0.293	-0.306	0.805	-0.498	-0.663	0.230	0.802
29	87	0.507	16.405	0.288	-0.274	0.847	-0.531	-0.494	0.274	0.771
30	87	0.543	15.540	0.326	-0.326	0.927	-0.439	-0.707	0.282	0.841
31	87	0.549	14.693	0.348	-0.380	1.078	-0.112	-0.617	0.324	0.819
32	87	0.491	15.526	0.295	-0.377	0.958	-0.274	0.250	0.298	0.564
33	87	0.527	15.059	0.327	-0.445	1.063	-0.349	0.578	0.341	0.651
34	87	0.560	16.072	0.325	-0.397	0.991	-0.648	0.113	0.335	0.784
35	87	0.617	16.292	0.353	-0.363	1.080	-0.558	-0.355	0.389	0.889
36	87	0.652	16.021	0.379	-0.401	1.113	-0.465	-0.605	0.414	0.996
37	87	0.689	16.778	0.383	-0.418	1.134	-0.605	-0.303	0.459	1.078
38	87	0.691	15.818	0.407	-0.428	1.285	-0.362	-0.390	0.470	1.011
39	87	0.722	14.760	0.456	-0.423	1.399	-0.139	-0.835	0.468	1.089
40	87	0.761	15.406	0.461	-0.376	1.421	-0.254	-0.711	0.498	1.168
41	87	0.770	16.571	0.433	-0.344	1.375	-0.473	-0.399	0.516	1.114
42	87	0.819	15.855	0.482	-0.337	1.469	-0.468	-0.589	0.490	1.229
43	87	0.819	15.760	0.485	-0.326	1.440	-0.644	-0.493	0.469	1.157
44	87	0.748	16.384	0.426	-0.314	1.144	-0.964	-0.189	0.494	1.084
45	87	0.765	15.713	0.454	-0.337	1.214	-1.060	0.021	0.537	1.083
46	87	0.811	15.653	0.483	-0.285	1.392	-0.756	-0.346	0.548	1.213
47	87	0.868	16.160	0.501	-0.280	1.534	-0.601	-0.396	0.536	1.255
48	87	0.919	15.529	0.552	-0.284	1.676	-0.444	-0.564	0.628	1.385
49	87	0.936	15.691	0.557	-0.304	1.786	-0.413	-0.192	0.617	1.264
50	87	0.929	15.689	0.552	-0.316	1.696	-0.560	-0.369	0.633	1.250
51	87	0.990	14.986	0.616	-0.310	1.801	-0.438	-0.878	0.566	1.433
52	87	1.017	15.229	0.623	-0.254	1.907	-0.402	-0.698	0.632	1.383
53	87	1.007	15.955	0.588	-0.237	1.835	-0.515	-0.530	0.651	1.339
54	87	1.056	15.178	0.649	-0.224	1.989	-0.429	-0.693	0.651	1.431
55	87	1.040	15.268	0.635	-0.250	1.893	-0.611	-0.635	0.635	1.403
56	87	0.974	14.594	0.623	-0.248	1.875	-0.344	-0.728	0.530	1.464
57	87	0.959	14.410	0.621	-0.241	1.793	-0.604	-0.673	0.405	1.332
58	87	1.022	14.629	0.651	-0.231	1.968	-0.420	-0.736	0.431	1.355
59	87	1.054	15.040	0.654	-0.201	2.024	-0.345	-0.682	0.538	1.495
60	87	1.113	14.512	0.715	-0.175	2.199	-0.222	-0.768	0.550	1.635

Appendix No. 2: The full version of the bootstrap test tables

BOOTSTRAPPING CUMULATIVE ABNORMAL RETURNS (CAR): Matching firms

I	N	TSTAT	mean1	F1-1%	F1-99%	F1-5%	F1-95%	Mean A	FA-1%	FA-99%	FA-5%	FA-95%	Adj-SK-t	mean1b	F1-1%b	F1-99%b	F1-5%b	F1-95%b
1	87	1.599	-0.016	-2.313	2.19	-1.584	1.622	0.004	-2.51	2.139	-1.814	1.598	1.719	-0.015	-2.562	2.358	-1.655	1.691
2	87	1.16	0.053	-2.319	2.362	-1.676	1.699	-0.055	-2.202	2.165	-1.589	1.523	1.163	0.058	-2.549	2.73	-1.797	1.891
3	87	0.801	0.006	-2.315	2.34	-1.724	1.604	-0.064	-2.445	2.17	-1.823	1.671	0.83	0.006	-2.381	2.422	-1.765	1.662
4	87	0.881	-0.025	-2.455	2.318	-1.772	1.654	-0.041	-2.523	2.372	-1.791	1.61	0.908	-0.025	-2.552	2.442	-1.835	1.72
5	87	1.452	0.006	-2.223	2.356	-1.715	1.66	-0.036	-2.621	2.357	-1.82	1.686	1.481	0.008	-2.294	2.4	-1.696	1.649
6	87	1.284	0.057	-2.312	2.385	-1.658	1.648	-0.024	-2.332	2.3	-1.752	1.59	1.298	0.059	-2.335	2.427	-1.707	1.672
7	87	0.276	-0.03	-2.374	2.367	-1.654	1.697	-0.033	-2.392	2.221	-1.758	1.583	0.28	-0.031	-2.462	2.423	-1.704	1.709
8	87	-0.183	0.033	-2.431	2.418	-1.718	1.674	0.015	-2.363	2.458	-1.672	1.739	-0.187	0.033	-2.427	2.419	-1.732	1.669
9	87	-0.18	-0.004	-2.365	2.337	-1.654	1.68	0.057	-2.197	2.497	-1.535	1.798	-0.186	-0.006	-2.394	2.351	-1.639	1.671
10	87	-0.145	0.054	-2.217	2.413	-1.595	1.777	-0.006	-2.277	2.221	-1.603	1.643	-0.151	0.054	-2.26	2.423	-1.618	1.794
11	87	0.595	0.028	-2.413	2.357	-1.608	1.681	-0.052	-2.38	2.482	-1.714	1.623	0.596	0.029	-2.512	2.406	-1.621	1.708
12	87	0.388	-0.086	-2.425	2.34	-1.768	1.667	0.116	-2.074	2.357	-1.487	1.74	0.38	-0.088	-2.536	2.497	-1.829	1.739
13	87	0.07	-0.06	-2.166	2.078	-1.508	1.486	0.033	-2.36	2.187	-1.678	1.643	0.068	-0.062	-2.267	2.146	-1.545	1.51
14	87	1.058	0.038	-2.279	2.582	-1.724	1.789	-0.046	-2.155	2.454	-1.738	1.601	1.068	0.038	-2.313	2.68	-1.755	1.818
15	87	1.526	-0.063	-2.495	2.261	-1.659	1.558	0.016	-2.368	2.146	-1.653	1.649	1.543	-0.065	-2.594	2.268	-1.668	1.585
16	87	1.303	0.012	-2.262	2.508	-1.659	1.682	-0.017	-2.462	2.293	-1.823	1.744	1.326	0.012	-2.258	2.516	-1.656	1.709
17	87	1.429	0.026	-2.522	2.656	-1.753	1.746	0.027	-2.524	2.388	-1.686	1.694	1.439	0.025	-2.495	2.688	-1.759	1.76
18	87	1.502	0.014	-2.442	2.296	-1.689	1.679	-0.043	-2.477	2.351	-1.768	1.591	1.543	0.014	-2.613	2.398	-1.72	1.706
19	87	1.319	0.06	-2.255	2.408	-1.575	1.71	-0.08	-2.357	2.1	-1.736	1.522	1.387	0.063	-2.396	2.638	-1.615	1.751
20	87	1.454	-0.031	-2.47	2.203	-1.732	1.669	-0.024	-2.368	2.262	-1.623	1.526	1.521	-0.029	-2.601	2.327	-1.753	1.735
21	87	0.674	-0.021	-2.442	2.274	-1.711	1.652	-0.045	-2.539	2.315	-1.845	1.623	0.683	-0.021	-2.514	2.29	-1.708	1.67
22	87	0.527	-0.013	-2.369	2.199	-1.666	1.568	0.013	-2.319	2.342	-1.736	1.801	0.526	-0.013	-2.433	2.224	-1.692	1.604
23	87	1.044	0.03	-2.397	2.622	-1.632	1.679	0.024	-2.283	2.347	-1.63	1.67	1.037	0.03	-2.47	2.695	-1.635	1.677
24	87	0.754	0.012	-2.257	2.143	-1.629	1.564	-0.046	-2.46	2.304	-1.62	1.575	0.757	0.012	-2.285	2.224	-1.659	1.596
25	87	1.272	0.02	-2.222	2.299	-1.716	1.627	-0.037	-2.547	2.431	-1.834	1.753	1.302	0.02	-2.229	2.437	-1.758	1.651
26	87	1.708	-0.025	-2.352	2.282	-1.755	1.681	-0.071	-2.487	2.234	-1.684	1.587	1.768	-0.024	-2.429	2.352	-1.751	1.712
27	87	2.157	-0.02	-2.337	2.457	-1.645	1.535	0.001	-2.286	2.268	-1.745	1.607	2.365	-0.019	-2.568	2.653	-1.753	1.641
28	87	2.07	0.023	-2.444	2.292	-1.731	1.71	-0.091	-2.31	2.051	-1.798	1.535	2.315	0.027	-2.863	2.661	-1.888	1.936
29	87	2.104	0.014	-2.504	2.341	-1.677	1.721	-0.069	-2.309	2.278	-1.715	1.607	2.36	0.017	-2.831	2.758	-1.885	1.889
30	87	1.984	-0.039	-2.257	2.24	-1.715	1.616	-0.028	-2.414	2.157	-1.681	1.571	2.192	-0.038	-2.562	2.563	-1.873	1.751

BOOTSTRAPPING CUMULATIVE ABNORMAL RETURNS (CAR): Matching firms (Continued)

I	N	TSTAT	mean1	F1-1%	F1-99%	F1-5%	F1-95%	Mean A	FA-1%	FA-99%	FA-5%	FA-95%	Adj-SK-t	mean1b	F1-1%b	F1-99%b	F1-5%b	F1-95%b
31	87	1.48	0.007	-2.272	2.429	-1.65	1.658	0.024	-2.257	2.208	-1.678	1.63	1.533	0.008	-2.563	2.655	-1.788	1.78
32	87	0.819	-0.018	-2.333	2.097	-1.648	1.662	-0.07	-2.377	2.035	-1.688	1.493	0.865	-0.022	-2.71	2.368	-1.826	1.818
33	87	0.541	0.009	-2.315	2.357	-1.704	1.624	-0.1	-2.357	2.037	-1.693	1.421	0.572	0.011	-2.679	2.708	-1.876	1.778
34	87	0.312	-0.024	-2.232	2.177	-1.655	1.601	-0.019	-2.349	2.178	-1.636	1.636	0.329	-0.026	-2.519	2.475	-1.79	1.716
35	87	0.279	0.009	-2.2	2.275	-1.564	1.687	0.023	-2.324	2.132	-1.615	1.6	0.291	0.011	-2.527	2.569	-1.713	1.819
36	87	0.343	-0.064	-2.144	2.213	-1.66	1.613	-0.052	-2.212	2.172	-1.672	1.508	0.354	-0.067	-2.435	2.52	-1.795	1.752
37	87	0.847	-0.032	-2.462	2.322	-1.691	1.683	-0.036	-2.188	2.182	-1.505	1.508	0.879	-0.033	-2.742	2.654	-1.851	1.763
38	87	1.022	0.034	-2.233	2.381	-1.576	1.625	-0.011	-2.417	2.16	-1.71	1.577	1.049	0.036	-2.437	2.656	-1.679	1.719
39	87	1.173	-0.03	-2.33	2.25	-1.751	1.63	0.046	-2.376	2.399	-1.569	1.727	1.198	-0.033	-2.509	2.391	-1.853	1.704
40	87	1.424	0.001	-2.357	2.359	-1.751	1.644	-0.056	-2.437	2.135	-1.812	1.646	1.467	-0.002	-2.579	2.536	-1.848	1.68
41	87	1.757	-0.086	-2.355	2.258	-1.759	1.579	-0.046	-2.292	2.263	-1.729	1.708	1.843	-0.091	-2.551	2.421	-1.864	1.64
42	86	0.821	-0.026	-2.181	2.249	-1.584	1.623	0.012	-2.421	2.25	-1.625	1.607	0.838	-0.026	-2.309	2.443	-1.651	1.68
43	86	0.585	0.007	-2.227	2.255	-1.69	1.692	-0.002	-2.27	2.271	-1.685	1.679	0.598	0.008	-2.331	2.429	-1.742	1.782
44	86	0.314	-0.053	-2.414	2.099	-1.675	1.525	-0.02	-2.299	2.152	-1.63	1.516	0.326	-0.057	-2.635	2.254	-1.765	1.542
45	86	0.171	0.008	-2.504	2.298	-1.729	1.729	0.068	-2.226	2.38	-1.506	1.666	0.178	0.008	-2.813	2.572	-1.853	1.84
46	85	0.116	0.007	-2.314	2.397	-1.625	1.534	-0.037	-2.146	2.16	-1.687	1.617	0.118	0.008	-2.546	2.634	-1.707	1.619
47	85	0.28	0.008	-2.121	2.251	-1.684	1.614	-0.051	-2.453	2.368	-1.773	1.549	0.285	0.009	-2.207	2.419	-1.777	1.706
48	85	0.119	0.044	-2.307	2.492	-1.6	1.74	0.023	-2.372	2.331	-1.717	1.58	0.119	0.046	-2.515	2.662	-1.694	1.803
49	85	-0.026	-0.046	-2.64	2.27	-1.71	1.7	-0.014	-2.242	2.241	-1.679	1.546	-0.024	-0.047	-2.657	2.336	-1.784	1.774
50	85	-0.14	-0.028	-2.198	2.294	-1.637	1.62	-0.011	-2.467	2.479	-1.683	1.779	-0.136	-0.025	-2.332	2.452	-1.715	1.717
51	85	-0.2	0.045	-2.185	2.227	-1.6	1.606	-0.031	-2.134	2.227	-1.642	1.622	-0.196	0.047	-2.329	2.409	-1.63	1.669
52	85	0.42	0.053	-2.273	2.484	-1.626	1.631	0.057	-2.085	2.39	-1.589	1.702	0.421	0.053	-2.468	2.643	-1.677	1.701
53	85	0.626	-0.024	-2.444	2.403	-1.739	1.7	-0.034	-2.361	2.167	-1.743	1.578	0.629	-0.023	-2.597	2.63	-1.801	1.797
54	85	0.718	-0.031	-2.323	2.156	-1.738	1.601	0.031	-2.208	2.307	-1.637	1.724	0.711	-0.032	-2.436	2.322	-1.795	1.679
55	84	0.408	0.011	-2.202	2.491	-1.687	1.649	0.025	-2.244	2.155	-1.631	1.64	0.401	0.012	-2.351	2.69	-1.778	1.719
56	84	0.033	0.035	-2.216	2.251	-1.652	1.613	0.013	-2.236	2.272	-1.56	1.764	0.022	0.034	-2.319	2.43	-1.732	1.691
57	84	-0.022	-0.008	-2.433	2.204	-1.624	1.632	-0.024	-2.32	2.433	-1.671	1.688	-0.03	-0.009	-2.657	2.293	-1.688	1.682
58	83	-0.275	0.034	-2.293	2.261	-1.568	1.706	0.054	-2.42	2.232	-1.634	1.694	-0.285	0.033	-2.47	2.363	-1.599	1.817
59	82	-0.262	0.009	-2.347	2.613	-1.651	1.761	0.08	-2	2.323	-1.522	1.688	-0.272	0.011	-2.493	2.821	-1.729	1.84
60	82	-0.245	0.071	-2.239	2.327	-1.624	1.755	0.048	-2.091	2.181	-1.453	1.676	-0.254	0.072	-2.404	2.48	-1.672	1.813

BOOTSTRAPPING CUMULATIVE ABNORMAL RETURNS (CAR): Market benchmark

I	N	TSTAT	mean1	F1-1%	F1-99%	F1-5%	F1-95%	Mean A	FA-1%	FA-99%	FA-5%	FA-95%	Adj-SK-t	mean1b	F1-1%b	F1-99%b	F1-5%b	F1-95%b
1	87	0.222	-0.029	-2.274	2.636	-1.681	1.607	-0.019	-2.254	2.294	-1.624	1.664	0.229	-0.029	-2.396	2.695	-1.742	1.661
2	87	1	0.038	-2.365	2.46	-1.633	1.707	-0.125	-2.543	2.033	-1.878	1.427	1.1	0.045	-2.699	2.767	-1.737	1.853
3	87	-0.872	-0.01	-2.271	2.612	-1.707	1.594	0.038	-2.146	2.164	-1.607	1.582	-0.864	-0.01	-2.417	2.789	-1.735	1.662
4	87	1.343	0.016	-2.339	2.218	-1.582	1.654	-0.005	-2.246	2.194	-1.611	1.649	1.371	0.017	-2.359	2.31	-1.58	1.66
5	87	-0.294	-0.044	-2.333	2.287	-1.716	1.676	-0.083	-2.536	2.06	-1.842	1.505	-0.274	-0.046	-2.457	2.445	-1.798	1.697
6	87	0.015	0.046	-2.312	2.384	-1.621	1.751	0.019	-2.361	2.203	-1.704	1.611	0.021	0.048	-2.299	2.388	-1.634	1.773
7	87	-0.035	0.001	-2.514	2.142	-1.625	1.637	0.008	-2.329	2.321	-1.761	1.774	-0.026	0.003	-2.587	2.179	-1.626	1.677
8	87	1.198	0.059	-2.442	2.373	-1.701	1.684	-0.003	-2.273	2.216	-1.667	1.683	1.212	0.061	-2.573	2.511	-1.728	1.753
9	87	-0.086	0.041	-2.26	2.438	-1.585	1.736	-0.032	-2.462	2.286	-1.639	1.569	-0.091	0.041	-2.317	2.383	-1.591	1.729
10	87	-1.357	-0.007	-2.139	2.209	-1.603	1.501	0.019	-2.254	2.348	-1.619	1.771	-1.364	-0.009	-2.197	2.245	-1.615	1.503
11	87	0.747	0.042	-2.41	2.454	-1.598	1.669	0.026	-2.27	2.38	-1.689	1.742	0.751	0.043	-2.434	2.564	-1.626	1.684
12	87	0.352	0.033	-2.462	2.481	-1.806	1.736	0.073	-2.146	2.42	-1.562	1.713	0.348	0.033	-2.562	2.559	-1.822	1.731
13	87	-2.312	-0.029	-2.22	2.196	-1.717	1.607	-0.049	-2.171	2.018	-1.706	1.529	-2.121	-0.027	-2.426	2.433	-1.833	1.745
14	87	2.526	0.02	-2.401	2.396	-1.648	1.75	-0.044	-2.315	2.16	-1.654	1.572	2.483	0.021	-2.54	2.532	-1.683	1.764
15	87	1.828	0.007	-2.197	2.263	-1.629	1.625	0.031	-2.311	2.264	-1.587	1.689	1.831	0.007	-2.226	2.25	-1.637	1.627
16	87	-0.111	0.045	-2.312	2.23	-1.688	1.649	-0.125	-2.456	1.942	-1.795	1.509	-0.07	0.051	-2.726	2.617	-1.916	1.89
17	87	0.491	0.032	-2.216	2.475	-1.56	1.579	0.027	-2.422	2.38	-1.744	1.688	0.494	0.033	-2.315	2.503	-1.56	1.618
18	87	0.988	0.016	-2.353	2.394	-1.733	1.681	-0.041	-2.32	2.09	-1.685	1.519	1.032	0.019	-2.588	2.594	-1.816	1.722
19	87	0.801	-0.024	-2.461	2.311	-1.724	1.701	-0.078	-2.598	2.071	-1.878	1.511	0.879	-0.022	-2.805	2.67	-1.873	1.845
20	87	2.477	0.015	-2.317	2.53	-1.612	1.77	0.041	-2.256	2.24	-1.673	1.675	2.593	0.02	-2.427	2.648	-1.647	1.846
21	87	-2.196	-0.004	-2.286	2.235	-1.731	1.632	0.035	-2.485	2.293	-1.607	1.7	-2.237	-0.003	-2.361	2.197	-1.784	1.666
22	87	-2.11	0.034	-2.207	2.489	-1.67	1.681	0.032	-2.337	2.376	-1.639	1.806	-2.187	0.035	-2.261	2.599	-1.696	1.712
23	87	1.957	-0.013	-2.177	2.33	-1.639	1.578	0.025	-2.48	2.387	-1.76	1.715	2	-0.012	-2.21	2.325	-1.629	1.586
24	87	-1.395	0.019	-2.346	2.316	-1.68	1.684	0.021	-2.387	2.31	-1.584	1.687	-1.416	0.018	-2.353	2.324	-1.675	1.692
25	87	0.439	0.042	-2.183	2.21	-1.651	1.661	-0.137	-2.179	1.862	-1.778	1.381	0.525	0.054	-2.904	2.821	-2.067	2.08
26	87	1.173	0.012	-2.109	2.266	-1.613	1.634	-0.055	-2.426	2.1	-1.735	1.55	1.219	0.015	-2.255	2.389	-1.661	1.736
27	87	1.052	-0.01	-2.249	2.246	-1.702	1.687	-0.144	-2.375	1.78	-1.851	1.377	1.18	-0.009	-2.808	2.742	-1.982	1.974
28	87	-0.594	0.011	-2.398	2.441	-1.743	1.671	-0.094	-2.325	2.187	-1.83	1.456	-0.55	0.012	-2.749	2.726	-1.897	1.8
29	87	0.38	0.064	-2.195	2.76	-1.631	1.717	-0.057	-2.364	2.295	-1.603	1.646	0.392	0.07	-2.427	3.088	-1.682	1.796

BOOTSTRAPPING CUMULATIVE ABNORMAL RETURNS (CAR): Market benchmark (Continued)

I	N	TSTAT	mean1	F1-1%	F1-99%	F1-5%	F1-95%	Mean A	FA-1%	FA-99%	FA-5%	FA-95%	Adj-SK-t	mean1b	F1-1%b	F1-99%b	F1-5%b	F1-95%b
30	87	-1.531	0.017	-2.357	2.191	-1.659	1.654	-0.003	-2.361	2.285	-1.622	1.698	-1.527	0.017	-2.419	2.318	-1.687	1.688
31	87	-1.437	-0.018	-2.433	2.304	-1.671	1.637	0.008	-2.424	2.175	-1.739	1.775	-1.4	-0.017	-2.554	2.467	-1.756	1.705
32	87	-0.326	0.027	-2.245	2.389	-1.573	1.657	0.024	-2.044	2.282	-1.604	1.687	-0.327	0.028	-2.244	2.543	-1.575	1.675
33	87	-3.137	-0.03	-2.331	2.238	-1.603	1.56	0.055	-2.129	2.421	-1.58	1.793	-3.543	-0.032	-2.516	2.389	-1.69	1.599
34	87	-1.354	-0.021	-2.354	2.351	-1.584	1.659	0.079	-2.203	2.372	-1.531	1.781	-1.396	-0.021	-2.381	2.454	-1.627	1.718
35	87	-0.071	-0.038	-2.234	2.401	-1.721	1.65	-0.015	-2.333	2.165	-1.754	1.636	-0.066	-0.036	-2.441	2.664	-1.812	1.723
36	87	-0.02	0	-2.226	2.158	-1.712	1.724	-0.054	-2.42	2.187	-1.668	1.547	-0.021	0.001	-2.341	2.278	-1.762	1.751
37	87	1.374	-0.096	-2.378	2.144	-1.683	1.464	-0.14	-2.614	1.945	-1.913	1.418	1.566	-0.103	-2.843	2.458	-1.864	1.556
38	87	-0.41	0.037	-2.46	2.392	-1.735	1.685	-0.068	-2.463	2.386	-1.823	1.701	-0.413	0.037	-2.563	2.489	-1.795	1.701
39	87	-0.424	-0.016	-2.314	2.429	-1.732	1.709	-0.045	-2.306	2.325	-1.743	1.568	-0.424	-0.016	-2.325	2.449	-1.737	1.695
40	87	0.45	0.015	-2.483	2.296	-1.705	1.694	-0.106	-2.402	1.999	-1.877	1.551	0.491	0.017	-2.736	2.515	-1.784	1.788
41	87	2.621	-0.055	-2.345	2.279	-1.814	1.778	-0.078	-2.487	2.012	-1.742	1.456	3.188	-0.053	-2.77	2.674	-2.062	2.014
42	86	-0.356	-0.071	-2.52	2.269	-1.796	1.628	-0.034	-2.281	2.148	-1.784	1.671	-0.341	-0.074	-2.736	2.383	-1.865	1.709
43	86	-0.243	-0.021	-2.292	2.267	-1.757	1.713	-0.12	-2.363	1.986	-1.739	1.467	-0.207	-0.021	-2.773	2.702	-2.025	1.981
44	86	0.922	0.006	-2.305	2.368	-1.577	1.675	-0.021	-2.332	2.231	-1.69	1.723	0.92	0.005	-2.425	2.387	-1.617	1.722
45	86	-0.27	0.015	-2.228	2.328	-1.632	1.7	0.091	-1.884	2.254	-1.436	1.629	-0.309	0.015	-2.604	2.749	-1.831	1.929
46	85	-1.379	0.017	-2.534	2.16	-1.72	1.681	-0.068	-2.522	2.232	-1.748	1.658	-1.294	0.019	-2.716	2.302	-1.73	1.713
47	85	1.244	0.007	-2.463	2.29	-1.662	1.623	-0.061	-2.49	2.025	-1.717	1.583	1.359	0.014	-2.657	2.561	-1.748	1.756
48	85	-0.581	-0.01	-2.199	2.298	-1.685	1.703	0.044	-2.261	2.166	-1.646	1.644	-0.575	-0.009	-2.304	2.403	-1.701	1.727
49	85	-1.139	0.014	-2.443	2.285	-1.704	1.619	-0.063	-2.48	2.241	-1.775	1.718	-1.076	0.015	-2.651	2.477	-1.78	1.709
50	85	0.353	0.028	-2.726	2.555	-1.749	1.83	0	-2.192	2.129	-1.582	1.608	0.373	0.031	-2.9	2.731	-1.822	1.877
51	85	-1.806	0.003	-2.353	2.343	-1.781	1.664	-0.02	-2.201	2.392	-1.651	1.68	-1.875	0.003	-2.422	2.393	-1.808	1.696
52	85	2.833	-0.023	-2.256	2.463	-1.731	1.75	0	-2.384	2.129	-1.704	1.645	2.958	-0.02	-2.332	2.571	-1.702	1.795
53	85	1.763	0.065	-2.234	2.446	-1.647	1.721	-0.061	-2.184	1.968	-1.711	1.509	1.978	0.074	-2.521	2.779	-1.796	1.888
54	85	0.049	0.019	-2.292	2.403	-1.53	1.633	0.023	-2.129	2.187	-1.647	1.666	0.057	0.021	-2.397	2.408	-1.577	1.662
55	84	-0.859	-0.027	-2.277	2.26	-1.688	1.73	0.111	-1.956	2.442	-1.439	1.784	-0.925	-0.028	-2.586	2.576	-1.835	1.821
56	84	-0.431	-0.048	-2.397	2.387	-1.734	1.578	0.078	-2.194	2.317	-1.619	1.858	-0.456	-0.055	-2.648	2.657	-1.867	1.626
57	84	0.329	0.037	-2.251	2.161	-1.677	1.629	0.007	-2.275	2.258	-1.543	1.587	0.329	0.038	-2.324	2.218	-1.726	1.653
58	83	-2.509	-0.012	-2.223	2.404	-1.679	1.606	0.105	-1.992	2.413	-1.471	1.816	-2.937	-0.018	-2.508	2.716	-1.854	1.769
59	82	0.488	0.012	-2.199	2.077	-1.635	1.611	-0.076	-2.415	1.896	-1.813	1.483	0.543	0.018	-2.581	2.427	-1.835	1.838
60	82	-1.17	-0.007	-2.223	2.234	-1.584	1.688	-0.031	-2.304	2.065	-1.674	1.535	-1.13	-0.004	-2.277	2.386	-1.634	1.717

BOOTSTRAPPING BHAR T-STAT: Market benchmark

I	N	TSTAT	F1-1%	F1-99%	F1-5%	F1-95%	Adj-SK-t	F1-1%b	F1-99%b	F1-5%b	F1-95%b
1	87	0.222	-2.437	2.328	-1.740	1.616	0.229	-2.517	2.314	-1.803	1.637
2	87	0.731	-2.296	2.290	-1.691	1.709	0.773	-2.443	2.509	-1.745	1.789
3	87	0.125	-2.473	2.299	-1.615	1.659	0.146	-2.616	2.364	-1.726	1.734
4	87	0.735	-2.313	2.377	-1.706	1.789	0.786	-2.471	2.687	-1.776	1.906
5	87	0.645	-2.100	2.320	-1.610	1.720	0.713	-2.497	2.790	-1.803	1.996
6	87	0.561	-2.360	2.225	-1.699	1.658	0.637	-2.871	2.758	-2.004	1.933
7	87	0.446	-2.311	2.361	-1.827	1.784	0.503	-2.754	2.780	-2.103	2.044
8	87	0.891	-2.627	2.087	-1.681	1.644	0.952	-2.875	2.266	-1.726	1.730
9	87	0.683	-2.375	2.312	-1.779	1.628	0.741	-2.629	2.594	-1.920	1.720
10	87	0.395	-2.247	2.319	-1.664	1.759	0.439	-2.530	2.634	-1.791	1.889
11	87	0.492	-2.328	2.164	-1.764	1.584	0.558	-2.810	2.568	-2.017	1.805
12	87	0.633	-2.355	2.194	-1.677	1.657	0.701	-2.758	2.546	-1.891	1.875
13	87	0.092	-2.074	2.018	-1.628	1.545	0.174	-2.815	2.738	-2.117	1.985
14	87	0.608	-2.082	2.053	-1.606	1.549	0.739	-2.768	2.741	-2.045	1.948
15	87	0.906	-2.183	2.021	-1.627	1.602	1.118	-2.995	2.708	-2.108	2.061
16	87	0.704	-2.091	2.316	-1.590	1.647	0.843	-2.721	3.068	-1.971	2.056
17	87	0.791	-2.136	2.201	-1.747	1.610	0.924	-2.670	2.779	-2.080	1.920
18	87	0.979	-2.185	2.015	-1.713	1.571	1.234	-3.060	2.775	-2.258	2.045
19	87	1.135	-2.171	2.119	-1.620	1.705	1.445	-3.007	2.939	-2.134	2.252
20	87	1.476	-2.039	2.204	-1.641	1.664	1.916	-2.753	3.025	-2.124	2.143
21	87	1.150	-2.146	2.247	-1.676	1.694	1.399	-2.768	2.921	-2.053	2.086
22	87	0.787	-2.166	2.351	-1.532	1.747	0.909	-2.637	2.921	-1.781	2.028
23	87	0.987	-2.261	2.165	-1.599	1.596	1.166	-2.843	2.729	-1.906	1.914
24	87	0.828	-2.426	2.394	-1.684	1.648	0.923	-2.825	2.816	-1.864	1.775
25	87	0.810	-2.266	2.344	-1.631	1.756	0.911	-2.678	2.808	-1.773	1.933
26	87	1.012	-2.347	2.365	-1.735	1.761	1.157	-2.781	2.857	-1.929	1.988
27	87	1.300	-2.170	2.124	-1.714	1.691	1.636	-2.895	2.792	-2.181	2.147
28	87	1.150	-1.977	1.890	-1.664	1.573	1.555	-2.925	2.766	-2.352	2.210
29	87	1.133	-1.846	1.850	-1.559	1.498	1.569	-2.780	2.787	-2.243	2.149
30	87	1.023	-2.144	1.974	-1.572	1.533	1.344	-3.168	2.850	-2.160	2.073

BOOTSTRAPPING BHAR T-STAT: Market benchmark(Continued)

I	N	TSTAT	F1-1%	F1-99%	F1-5%	F1-95%	Adj-SK-t	F1-1%b	F1-99%b	F1-5%b	F1-95%b
31	87	0.805	-2.201	2.039	-1.624	1.645	0.981	-2.947	2.698	-2.064	2.088
32	87	0.793	-1.997	1.931	-1.578	1.562	1.033	-2.902	2.798	-2.177	2.159
33	87	0.618	-1.887	1.810	-1.526	1.504	0.828	-2.826	2.682	-2.176	2.136
34	87	0.345	-2.026	1.880	-1.656	1.539	0.469	-2.903	2.650	-2.266	2.057
35	87	0.332	-1.820	1.832	-1.480	1.453	0.478	-2.711	2.735	-2.102	2.058
36	87	0.378	-1.920	1.871	-1.518	1.521	0.523	-2.836	2.740	-2.115	2.129
37	87	0.454	-1.919	1.844	-1.519	1.527	0.609	-2.799	2.663	-2.091	2.112
38	87	0.149	-2.327	2.204	-1.674	1.741	0.232	-3.212	2.988	-2.125	2.252
39	87	0.065	-2.170	2.060	-1.654	1.563	0.140	-2.879	2.698	-2.058	1.960
40	87	0.147	-1.911	2.101	-1.570	1.661	0.232	-2.537	2.855	-2.014	2.142
41	87	0.378	-2.046	2.128	-1.590	1.589	0.493	-2.844	2.991	-2.085	2.095
42	86	0.426	-1.958	1.956	-1.622	1.536	0.562	-2.773	2.782	-2.171	2.070
43	86	0.460	-1.990	2.043	-1.629	1.651	0.588	-2.746	2.840	-2.149	2.188
44	86	0.666	-1.845	1.807	-1.592	1.498	0.876	-2.685	2.611	-2.232	2.088
45	86	0.752	-1.619	1.670	-1.365	1.358	1.044	-2.456	2.554	-1.998	1.986
46	85	0.658	-1.893	1.877	-1.500	1.541	0.861	-2.742	2.710	-2.066	2.136
47	85	0.816	-2.215	2.108	-1.681	1.580	0.989	-2.946	2.786	-2.101	1.977
48	85	0.760	-2.272	2.144	-1.551	1.567	0.874	-2.579	2.500	-1.773	1.769
49	85	0.591	-2.311	2.057	-1.787	1.648	0.695	-2.894	2.547	-2.174	1.981
50	85	0.752	-2.251	2.280	-1.717	1.738	0.892	-2.866	2.908	-2.090	2.138
51	85	0.466	-2.229	2.042	-1.605	1.586	0.555	-2.776	2.536	-1.865	1.900
52	85	0.643	-2.393	2.141	-1.731	1.615	0.755	-3.030	2.682	-2.051	1.903
53	85	0.669	-2.508	2.331	-1.603	1.673	0.769	-3.107	2.840	-1.840	1.920
54	85	0.595	-2.361	2.267	-1.617	1.666	0.652	-2.463	2.404	-1.685	1.767
55	84	0.679	-2.201	2.189	-1.597	1.521	0.737	-2.367	2.394	-1.622	1.584
56	84	0.683	-2.291	2.213	-1.629	1.687	0.747	-2.523	2.402	-1.689	1.778
57	84	0.799	-2.395	2.219	-1.643	1.535	0.873	-2.478	2.419	-1.685	1.578

BOOTSTRAPPING BHAR T-STAT: Match firms

I	N	TSTAT	F1-1%	F1-99%	F1-5%	F1-95%	Adj-SK-t	F1-1%b	F1-99%b	F1-5%b	F1-95%b
1	87	1.599	-2.36	2.362	-1.722	1.772	1.719	-2.487	2.533	-1.818	1.807
2	87	1.132	-2.245	2.371	-1.709	1.648	1.123	-2.59	2.721	-1.9	1.731
3	87	0.918	-2.294	2.34	-1.605	1.75	0.954	-2.262	2.356	-1.623	1.776
4	87	0.872	-2.266	2.291	-1.628	1.514	0.881	-2.242	2.389	-1.652	1.534
5	87	1.658	-2.359	2.336	-1.627	1.656	1.667	-2.327	2.35	-1.626	1.676
6	87	1.599	-2.249	2.18	-1.641	1.573	1.625	-2.348	2.247	-1.672	1.605
7	87	0.535	-2.393	2.601	-1.682	1.726	0.544	-2.382	2.702	-1.737	1.765
8	87	0.427	-2.316	2.509	-1.731	1.679	0.432	-2.404	2.515	-1.779	1.712
9	87	0.292	-2.491	2.251	-1.741	1.724	0.288	-2.559	2.359	-1.795	1.737
10	87	0.335	-2.322	2.153	-1.704	1.615	0.342	-2.415	2.25	-1.761	1.649
11	87	0.979	-2.447	2.407	-1.788	1.571	1.036	-2.741	2.656	-1.912	1.647
12	87	0.703	-2.277	2.382	-1.675	1.68	0.728	-2.566	2.714	-1.782	1.803
13	87	0.512	-2.198	2.269	-1.674	1.673	0.577	-2.736	2.814	-1.959	2.012
14	87	1.398	-2.259	2.324	-1.703	1.67	1.624	-2.804	2.901	-2.006	1.968
15	87	1.746	-2.356	2.307	-1.662	1.73	2.085	-2.976	2.853	-1.963	2.043
16	87	1.367	-2.44	2.327	-1.743	1.591	1.518	-2.838	2.696	-1.954	1.748
17	87	1.67	-2.249	2.372	-1.65	1.683	1.793	-2.486	2.669	-1.736	1.787
18	87	1.69	-2.221	2.286	-1.597	1.686	2.025	-2.768	2.793	-1.884	1.994
19	87	1.578	-2.216	2.043	-1.777	1.57	1.935	-2.753	2.567	-2.195	1.9
20	87	1.689	-2.081	2.118	-1.535	1.629	2.056	-2.587	2.666	-1.831	1.947
21	87	1.357	-2.243	2.175	-1.541	1.639	1.53	-2.656	2.547	-1.679	1.823
22	87	1.254	-2.368	2.459	-1.672	1.654	1.342	-2.482	2.754	-1.705	1.716
23	87	1.735	-2.47	2.485	-1.647	1.652	1.837	-2.639	2.635	-1.724	1.69
24	87	1.501	-2.404	2.281	-1.83	1.666	1.599	-2.551	2.486	-1.915	1.69
25	87	1.732	-2.477	2.317	-1.734	1.797	1.934	-2.801	2.63	-1.865	1.943
26	87	2.006	-2.323	2.203	-1.666	1.632	2.29	-2.636	2.508	-1.779	1.776
27	87	2.234	-2.184	2.215	-1.694	1.669	3.031	-2.914	2.949	-2.135	2.096
28	87	1.851	-1.888	1.92	-1.579	1.533	2.743	-2.792	2.85	-2.242	2.161
29	87	1.78	-1.782	1.798	-1.51	1.482	2.679	-2.666	2.7	-2.164	2.13
30	87	1.867	-1.966	1.857	-1.59	1.456	2.725	-2.892	2.687	-2.214	2.002

BOOTSTRAPPING BHAR T-STAT: Match firms (Continued)

I	N	TSTAT	F1-1%	F1-99%	F1-5%	F1-95%	Adj-SK-t	F1-1%b	F1-99%b	F1-5%b	F1-95%b
31	87	1.598	-2.182	2.018	-1.734	1.564	2.008	-2.912	2.648	-2.181	1.913
32	87	1.078	-1.979	1.961	-1.574	1.524	1.418	-2.876	2.846	-2.173	2.088
33	87	0.954	-1.903	1.78	-1.512	1.496	1.274	-2.841	2.609	-2.134	2.113
34	87	0.84	-2.003	1.973	-1.554	1.55	1.054	-2.807	2.775	-2.071	2.065
35	87	0.772	-1.839	1.86	-1.567	1.477	0.997	-2.638	2.688	-2.186	2.031
36	87	1	-2.1	1.982	-1.566	1.537	1.3	-3.091	2.877	-2.159	2.115
37	87	1.229	-1.946	1.868	-1.539	1.467	1.661	-2.861	2.712	-2.139	2.024
38	87	1.514	-2.197	2.188	-1.677	1.561	1.935	-2.991	2.97	-2.158	1.978
39	87	1.729	-2.08	2.02	-1.631	1.564	2.245	-2.751	2.686	-2.07	1.982
40	87	1.842	-2.157	2.009	-1.642	1.59	2.474	-2.982	2.724	-2.124	2.053
41	87	1.945	-1.897	2.036	-1.479	1.596	2.706	-2.596	2.848	-1.932	2.12
42	86	1.473	-1.982	1.9	-1.493	1.568	2.002	-2.818	2.707	-2.021	2.143
43	86	1.484	-2.052	1.982	-1.63	1.646	1.976	-2.82	2.763	-2.181	2.191
44	86	1.284	-1.946	1.781	-1.533	1.444	1.764	-2.888	2.58	-2.15	1.997
45	86	1.1	-1.696	1.766	-1.477	1.405	1.547	-2.577	2.698	-2.173	2.035
46	85	1.067	-2.027	1.83	-1.711	1.599	1.321	-2.911	2.572	-2.368	2.182
47	85	1.492	-2.307	2.023	-1.692	1.627	1.851	-3.016	2.664	-2.13	2.022
48	85	1.129	-2.135	2.322	-1.613	1.775	1.136	-2.666	2.982	-1.903	2.11
49	85	0.977	-2.335	2.266	-1.694	1.591	1.048	-3.003	2.921	-2.013	1.87
50	85	0.916	-2.134	2.126	-1.596	1.647	0.987	-2.743	2.729	-1.943	2.022
51	85	0.889	-2.187	2.415	-1.693	1.846	0.954	-2.806	3.187	-2.069	2.285
52	85	1.154	-2.078	2.117	-1.627	1.562	1.196	-2.629	2.674	-1.956	1.879
53	85	1.297	-2.167	2.296	-1.691	1.682	1.331	-2.708	2.905	-2.023	2.041
54	85	1.313	-2.104	2.26	-1.603	1.648	1.165	-2.587	2.84	-1.918	1.97
55	84	0.891	-2.041	2.319	-1.578	1.622	0.735	-2.683	3.122	-1.967	2.049
56	84	0.389	-1.813	2.025	-1.512	1.574	0.274	-2.531	2.905	-2.03	2.128
57	84	0.633	-2.186	2.14	-1.648	1.688	0.509	-2.978	2.931	-2.137	2.204
58	83	0.327	-2.024	2.13	-1.551	1.594	0.225	-2.839	3.053	-2.07	2.132
59	82	0.12	-1.96	2.104	-1.454	1.632	0.022	-2.81	3.091	-1.958	2.247
60	82	0.406	-2.107	2.114	-1.616	1.574	0.318	-2.809	2.807	-2.044	1.978