EVA and shareholder value creation: an empirical study

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EVA and Shareholder Value Creation:

An Empirical Study

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DEDICATION

This thesis is dedicated to my beloved father

who supported, inspired, and encouraged me to pursue my education to my fullest abilities.

He was always my great friend and mentor!

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ABSTRACT

In recent years, a variant of residual income often called Economic Value Added (EVA)[1] or Economic Income (EI) has become a popular concern in academia and business communities. This study investigates the general hypothesis that EVA is more highly associated with shareholder wealth and firm values than are traditional performance measures. Two commonly used value-based performance metrics namely, Total Shareholder Return (TSR) and Tobin's Q are also considered to highlight the value-relevance of EVA vis-à-vis these measures in predicting shareholder wealth.

Using a sample of panel data of around 12,000 firm-year observations taken from the Stern Stewart 1000 EVA/MVA database and the DATASTREAM file over the period 1991–2002, this study finds compelling evidence that shareholder value is a function of EVA. This study also provides evidence consistent with the notion that EVA outperforms other traditional performance measures in explaining shareholder wealth. Value-relevance tests reveal EVA to be more highly associated with shareholder wealth than TSR and Tobin's Q. The incremental tests also suggest that EVA possesses the largest explanatory power (or information usefulness) over TSR and Tobin's Q. These results conclusively support the claims made by EVA proponents and further support the potential usefulness of the EVA metric for internal and external performance.

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[1] Economic Value Added or EVA is a relatively new measure of corporate performance developed and trademarked in the late 1980s by the US-based business consultants Stern Stewart and Co. (hereafter referred to as Stern Stewart).

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Chapter 1

INTRODUCTION

The link between performance measures and shareholder value creation has become an issue of considerable academic and practitioner interest. Academic researchers, corporate executives, and business analysts have engaged in a rather heated debate in the last decade or so as to whether the new value-based performance metrics have a higher correlation with stock values and their returns than do other traditional accounting-based measures.[2] Economic Value Added (or EVA), the residual income remaining after all costs, including the opportunity cost of the equity capital employed, is among the few performance metrics that have been widely adopted and are claimed to approximate shareholder returns. In effect, EVA is promoted by its proponents as being superior to other traditional and non-traditional performance metrics as a determinant and predictor of corporate success and value creation (Stewart, 1991; Ehrbar, 1998).

Nevertheless, despite the growing amount of literature that has attempted to evaluate the claims made about EVA's superiority; little empirical research has so far been done to support the above assertions (e.g., Ittner & Larcker, 1998; Lehn and Makhija, 1997; Lovata and Costigan, 2002; Yook, 1999; Feltham et al., 2004). Moreover, the limited studies that have appeared in the literature have produced somewhat conflicting conclusions. For instance, Biddle et al. (1997); Chen and Dodd (1997); Fernandez (2002);

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[2] See, for example, Ittner and Larcker (1998 and 2001); Black et al. (2001); Arnold and Davies (2000); Garvey and Milbourn (2000); Myers (1996); Chen and Dodd (1997); Biddle et al. (1997); Worthington and West (2004); Erasmus and Lambrechts (2006); Rajan (2000); Feltham et al. (2004); Ferguson et al. (2005); and Fabozzi and Grant (2000).

Paulo (2003); Palliam (2006); and Stark and Thomas (1998) have mostly not been supportive of these claims. On the other hand, Grant (1996, 2003); Lehn and Makhija (1996, 1997); Zafiris and Bayldon (1999); Young and O'Byrne (2001); Worthington and West (2004); Tully (1993, 1998); Ferguson et al. (2005); Erasmus and Lambrechts (2006); and Feltham et al. (2004) have made contributions that favour EVA on theoretical and/or empirical grounds.

The inconclusive and mixed results of these studies raise an important question. Is EVA really superior to other alternative performance measures or is it merely a fad promoted by a management consultancy firm? This conflicting evidence thus necessitates the conducting of further studies that may provide better insight and understanding into this complex, yet crucial relationship between shareholder wealth creation and EVA. To further this idea, Lovata and Costigan (2002, p.226) stated, "Economic Value Added is a concept that requires much additional research to support or contest the claims of its developers." Likewise, Feltham et al. (2004, p.83) suggests that the debate should be reopened regarding whether EVA has greater relevance than other performance measures.

On the other hand, there has been an emphasis in previous empirical work in this area on either a cross-section of companies or on a limited set of panel data. For example, Bao and Bao (1998) only employed a cross-section of 166 firms over the period of 1992-93; whereas, Grant (2003) focused on only 50 of the largest U.S. wealth creators/destroyers at year-end 2000. Clearly, an examination of extended "panel data" would certainly permit greater empirical certainty on the usefulness of EVA as an

advanced measure of corporate performance and value creation. Thus, the scope of this study must out of necessity go further.

This study, therefore, explores the suitability of using EVA as a measure of corporate success as well as providing additional empirical evidence on the use of EVA. Specifically, the statistical association between EVA and the creation of shareholders wealth has been empirically examined and highlighted. The efficiency of two alternative value-based performance measures—namely, Total Shareholder Return (TSR) and Tobin's Q was also considered vis-à-vis EVA to assert or refute its superiority. In this chapter, the overall objectives of the thesis are highlighted, and are followed by a brief discussion of the three research questions that form the foundation of this study and so comprise the basis for its hypotheses.

1.1 Objectives of the Study

The primary objective of this thesis is to empirically test the assertion that EVA is highly associated with Market Value Added (or MVA). Market Value Added is defined as the difference between the market value of the firm (including equity and debt) and the total capital invested in the firm (Young and O'Byrne, 2001, p.29). It is a measure of external performance, which is considered to be the best indicator of shareholder value creation. The study does not seek, though, to fully explain the determinants of MVA, but only to show how well EVA acts as a genuine explanatory variable for MVA, in order to justify its usefulness for performance measurement, shareholder value creation, executive compensation, and financial reporting.

Thus, the objectives of this study are three-fold. First, to ascertain whether there is a significant statistical association between EVA and shareholder wealth. Second, to examine which value-based performance metric (EVA, TSR, or Tobin's Q) has a greater association with market value added (MVA). Finally, to attempt to uncover whether the components unique to EVA—namely, net operating profit after tax (NOPAT), return on invested capital (ROIC), profitability index (PI), Capital Growth (CG), cost of capital (WACC), and total invested capital (TIC) -- help in explaining contemporaneous MVA beyond that explained by traditional value-based performance measures.

1.2 Research Questions and Hypotheses

The hypotheses to be tested are derived from the notion that EVA is generally more highly associated with shareholder returns and firm value than are other alternative performance measures. Thus, this study poses the following questions:

- Does a statistical relationship between EVA and shareholder wealth in the sense of contemporaneous Market Value Added (MVA) exist, and if it does, how much of the variation (i.e., change) of the shareholder value can be explained by EVA?
- Does EVA dominate other commonly-used value-based measures in explaining MVA?
- Do components unique to EVA help to explain contemporaneous MVA beyond that explained by traditional value-based performance measures?

These three questions form the foundation of this study and consequently comprise the basis for its hypotheses. While the first question explores the direction and the strength of the relationship between EVA and MVA; the second and third one's investigate the efficiency of EVA vis-à-vis other alternative performance metrics in predicting shareholder value.

1.3 Outline of Thesis

To address these research questions, this study is organized as follows:

In Chapter 2, the relevant literature on value-based performance metrics and shareholder value creation is reviewed and discussed. Chapter 3 presents the empirical research hypotheses. Chapter 4 describes the population and data sources as well as presenting the research design and methodologies for testing the hypotheses. In Chapter 5, the results of a comprehensive statistical investigation are presented for each hypothesis and discussed in detail. Finally, chapter 6 summarizes the statistical results and discusses additional aspects of this study for future research.

1.4 Concluding Remarks

Over the last two decades or so, there has been a growing concern among business analysts, academics, and professional managers that traditional accounting measures of performance are no longer appropriate for the purpose of strategic decisions and control. In the ongoing search for more adequate performance measures that show some link to

shareholder value, a number of alternative value-based metrics have been developed and promoted by their respective advocates. The EVA, which is a residual income metric that subtracts the cost of capital from the operating profits generated in the business, seems to have emerged as a real improvement over the traditional accounting measures. This study explores the assertion that EVA is a superior measure of performance and value creation. In the following chapters, this issue will be thoroughly investigated and empirically examined.

Chapter 2

BACKGROUND AND LITERATURE REVIEW

2.1 Introduction

The association between alternative performance measures and firm value has attracted a great deal of academic interest for a long period of time. Several explanations and predictions regarding this relationship have been raised in both the economic and accounting literature. The central topic addressed in this chapter involves how the value creation process of the firm is reflected in alternative value-based performance metrics. The purpose of this chapter is to provide the basic theoretical and empirical foundation for the thesis as well as give a detailed review of six of the most widely used and discussed value-based performance metrics in the business world and academic literature – that is, Economic Value Added (EVA); Market Value Added (MVA); Cash Flow Return on Investment (CFROI); Market-to-Book Value Ratio (MBV) better known as Tobin's 'Q'; Total Shareholder Return (TSR); and the Balanced Scorecard (BSC). The specific relationships between these performance metrics and shareholder value creation will also be discussed and highlighted. Concluding remarks are provided at the end of the chapter.

2.2 Shareholder Value Approach

Over the last decade or so and in particular globalization, de-regulation, trade liberalization, technological changes, transparency or fuller disclosure of activities, and the information revolution including the internet, as well as the increasing sophistication of the

financial markets have become the dominant forces behind the transformation of corporations and the climate in which they operate. Companies across the globe are now under unprecedented pressure to adapt to this new climate and to perform consistently well in all markets, in which they compete –namely, the product market, the labour market, and the capital market. Otherwise, they would be out of business.

What will corporate success look like in the decades ahead? Certainly, the rules of the game have changed. Corporations are now finding that making good products and trying desperately to satisfy customers are still necessary, but are no longer sufficient. Nor is it enough to focus on traditional earning figures alone. The key to success in today's business environment is the simultaneous delivery of a superior return to investors, proactively managing risks, focusing on core businesses, removing constraints, doing business differently, as well as maintaining sustainable growth rates.

A team of experts at Price Waterhouse Coopers aptly declared that, even though, these challenges may look new; essentially, they are the same old ones in a different guise (Black et al., 2001, p.24). The three aspects of market activity, that is risk, growth, and return, continue to be crucial. The fact that cash is king and investors require an adequate compensation for the risks they bear, has not changed. What has changed, though, is the focus. Despite the fact that the capitalist system has always seemed to be structured to serve the interest of the owners of the equity (i.e., the shareholders); it is only now, with increased globalization and a sophistication of financial markets, that shareholders' interests have become the focal point for all critical corporate activities. Successful

companies of the future will be those that make managing and creating shareholder value (SHV) the central goal of their corporate and business strategies.

There is no lack of evidence that focusing on optimizing shareholder value is the best way to ensure a firm's long-term prosperity. McTaggart et al. (1994, p.10), for example, argued that "maximizing shareholder value is superior to any other governing objective a company might adopt because it will lead managers to make the decisions most likely to increase the company's competitive, organizational, and financial strength over time". However, corporate managers may not always engage in transactions that are solely in the best interest of shareholders. Studies show that those managers who fail to deliver value to shareholders in the race for global capital resources, will find their companies at a competitive disadvantage. As Young and O'Byrne (2001, p.13) aptly put it, "They must learn to navigate the rough seas of competitive capital markets, or they will find themselves replaced by managers who can". Rappaport (1998) also points out:

> "The threat of takeover is an essential means of constraining corporate managers who might choose to pursue personal goals at the expense of shareholders. Any significant exploitation of shareholders should be reflected in a lower stock price. This lower price, relative to what it might be with more efficient management, offers an attractive takeover opportunity for another company, which in many cases will replace incumbent management." (p.4)

Likewise, Copeland et al. (1996) reported that maximizing shareholder value appears to be closely linked with a higher standard of living, greater overall productivity and competitiveness, and a better functioning equity market.

> "If countries whose economic systems are not based on maximizing shareholder value give investors lower return on capital than those who do,

> they will slowly be starved for capital, as capital markets continue to globalize, falling farther and farther behind in global competition." (p.4)

They go on:

> "If suppliers of capital do not receive a fair return to compensate them for the risk they are taking, they will move their capital across national borders in search of better returns. If they are prohibited by law from moving their capital, they will consume more and invest less. Either way, nations who don't provide global investors with adequate returns on invested capital are doomed to fall farther behind in the race for global competitiveness and suffer a stagnating or decreasing standard of living." (p.27)

Empirical studies and business reports show that there has been widespread worldwide interest in SHV-based systems and performance measurement approaches (Ittner & Larcker, 1998; Black et al., 2001). A good number of relatively high-profile corporations have already taken steps towards installing and implementing a SHV measurement system -- not only in the USA, Europe, and Japan, but also in many other emerging economies such as that of Singapore, South Korea, India, China, Brazil, and Hungary. To quote Black et al. (2001, p.255) over 5% of the FT 500 companies and about 8% of the FT Global 500 have now installed a SHV/performance measurement system and, in many cases, the large corporations have been the ones to take the lead.

The growing predominance of the SHV culture is largely a consequence of several major developments, which, among others, include the following:[3]

1) The globalization and deregulation of financial markets;

2) New advances in information technology including the internet;

3) Generational changes in attitudes toward savings and investment;

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[3] For more details, see for example, Shiller (2000); Soros (2000); and Young and O'Byrne (2001).

4) The expansion of institutional investment; and

5) 'Irrational exuberance'[4].

The global economy is increasingly characterized by a freer trade in factors as well as in goods and services. Among other things, this means that investors now have the possibility of moving their money much faster and more easily around the world as they are constantly in search of the greatest return. As a result, interest rates, exchange rates, and stock prices in various countries are invariably interrelated, says American billionaire and financial mogul, George Soros. He goes further to assert that global financial markets exert a tremendous amount of influence on economic conditions throughout the world. In today's business environment, financial capital enjoys a privileged position as it is more mobile than other factors of production (Soros, 2000).

Moreover, interest in all kinds of stock: in high tech companies, in new and old-economy firms, as well as in general investing, has grown in unprecedented ways in recent history. This culminates in a colossal worldwide explosion of mutual funds, unit trusts, and novel forms of institutional investment like hedge funds. According to some observers, many more people can have a financial stake in companies, especially, through mutual funds or pension funds. What is of particular importance to corporate managers, though, is that these funds are controlled by professional managers who care only about performance and about delivering the highest possible returns to the people who hired them (Young and O'Byrne, 2001, p.7).

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[4] The term "irrational exuberance" was coined by Alan Greenspan, chairman of the US Federal Reserve Board, to describe the dot.com boom. It was also the title of a book by Professor Robert Shiller from Yale University that examined the boom. In his book, Shiller (2000) argued that, as the bull market developed, it generated optimism about the future and stimulated demand for shares.

On the other hand, one could argue that corporate managers often get confused; if not trapped, when they face multiple objectives or when they are held accountable to more than one party/objective. To avoid such confusion or conflicting signals, they have to focus on only one prime overriding objective. This simplifies matters and makes a great deal of difference. As Brittan (1996) pointed out, "People function best if they have specific responsibilities for which they are held accountable by means which are transparent, verifiable and respect the realities of human nature." The objective of maximizing shareholder value seems to be absolutely sound as it not only allows for just such a responsibility, but it also provides the transparent and verifiable means necessary to measure it. In short, one can conclude that it has all the characteristics of the "right" objective.

The theories underlying SHV have a long history stretching back to the intellectual work of Markovitz (1952), Modigliani and Miller (1961), Lintner (1965), Sharpe (1964), and Fama (1965) to name just a few. According to Black et al. (2001, p.21), the SHV discipline started to take on a life of its own as a result of work done on the Capital Asset Pricing Model (CAPM). The fundamental idea behind this model is that the expected return on equity is linearly related to its systematic or market risk, as measured by beta. The higher the beta, the greater the expected return.[5] Black et al. further point out that:

> "the key insight of the CAPM model - one that is central to the SHV view of the world - is that there is a risk-weighted discount factor which allows [one] to assess the value today of tomorrow's developments, profits and cash flows. This discount

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[5] It is important to note that, as great a development as CAPM was, it is not without serious criticism. The number of papers trying to empirically validate it is so large that we will not attempt to catalogue them all. For more detail, see for example, Blum and Friend (1973); Fama and French (1992, 2004); and Bornholt (2007).

rate is derived from observations of capital markets, and defines what the opportunity cost of equity to investor in the market is. It states what the company has to earn in order to justify the use of the capital resources tied up in the business."(p.22)

The SHV approach has gained widespread acceptance since the publication of '*Creating Shareholder Value*' by Alfred Rappaport in 1986.[6] This text provided a new and in-depth assessment of the rationale for the SHV approach as well as the tools needed to implement it as a standard for business performance. According to Rappaport (1998, p.32), the total value of an entity such as a firm or business unit is equal to the sum of the values of its equity and its debt. This economic or strategic value of the business is termed "corporate value" and the value of the equity portion is termed "shareholder value". The value of the firm can then be written as:

$$Corporate\ Value = Shareholder\ Value + Debt\ Value \tag{2.1}$$

Thus, in order to determine shareholder value, one must first determine the value of the total firm or business unit, that is, corporate value. To value a company, several writers and management consulting firms (e.g., Damodaran, 2006; Copeland, 1996; Titman and Martin, 2008; McKinsey & Company, 2005), have proposed analyzing the company's historical performance; defining and projecting free cash flow over the short, medium and long run; and discounting the projected free cash flows at an appropriate cost of capital. Using the free cash flow (FCF) approach, the total business value is determined by the so-

[6] A revised and updated version of the original edition was published in 1998.

called "Free Cash Flows to the Firm" (FCFF), discounted at the "Weighted Average Cost of Capital" (WACC). Since the expected FCFF cannot be estimated forever, it is suggested that it be estimated during the "forecast period" of five or ten years and that a "residual value" (or terminal value) be estimated for the period beyond the forecast period. The present value of the FCFF over the forecast period plus the present value of the residual value would result in the value of the business as a whole. In general terms, the value of a firm that expects to sustain extraordinary growth for N years can be written as:

$$\textit{Corporate Value} = \left[\sum_{t=1}^{N} \frac{\text{Expected Cash Flow to the Firm}_t}{(1+\text{WACC})^t}\right] + \left[\frac{\text{Terminal Value}_N}{(1+\text{WACC})^N}\right] \qquad (2.2)$$

For a more precise estimate of corporate value, a third component to be added to the corporate value model; that is, the current value of marketable securities and other non-operating assets such as investments that can be converted to cash, which are not essential to operating the business (Rappaport,1998, p.33). Thus, the value of a firm can be written as the sum of three components:

Corporate Value = Present value of cash flow from operations during the forecast period
+ Residual value
+ Marketable securities and other nonoperating assets (2.3)

After the value of the firm as a whole has been determined, the part of the value available to the shareholders is calculated as follows:

$$Shareholder\ Value = Corporate\ Value - Debt\ Value$$

or

$$SHV_0 = \left[\sum_{t=1}^{N} \frac{FCFF_t}{(1+WACC_t)^t}\right] + \left[\frac{FCFF_{N+1}}{WACC_t - g_N}\right] - \left[\sum_{t=1}^{\infty} \frac{CF_{FI,t}}{(1+R_{FI,t})^t}\right] \quad (2.4)$$

where

SHV_0 = shareholder value in year 0 (current year)
$FCFF_t$ = expected free cash flows to the firm in year t
N = number of years of high or extraordinary growth
g_N = stable growth beyond year N
$WACC_t$ = weighted average cost of capital in year t
$CF_{FI,t}$ = expected cash flow of a fixed income security (debt obligations and other claims such as preferred stock in year t
$R_{FI,t}$ = required rate of return to be used to discount the cash flows in year t

The idea of measuring shareholder value by comparing cash flows generated by the business against the cost of capital used in generating those flows is to provide a clear understanding of value creation or degradation over time within each business unit. Rappaport (1998, pp.55-57) indicated that shareholder value is driven by seven factors: sales growth, operating profit margin, income tax rate, working capital investment, fixed capital investment, weighted average cost of capital, and value growth duration. The theory is that improvement in these value drivers leads directly to an increase in shareholder value as shown in Figure 1.

In the 1990s, interest in the SHV approach received a further boost first by the publication of '*Valuation: Measuring and Managing the Value of Companies*' by Tom

Copeland, Tim Koller, and Jack Murrin from the McKinsey Group[7], and second by the publication of '*The Quest for Value*' by G. Bennett Stewart.[8] The Copeland text demonstrates in great detail how businesses create value and argues that companies thrive when they create real economic value for their shareholders. This text further asserts that companies create value by investing capital at rates of return that exceed their cost of capital (WACC). Copeland et al. (1996) put forward the idea that the application of SHV principles to companies is both feasible and highly desirable. They also debate whether such an approach can yield substantial benefits not only to shareholders, but also to other 'stakeholders' in a company.

On the other hand, Stewart's book (*The Quest for Value*) introduces the idea of economic value added (EVA) -- a revolutionary new concept that has been developed by the US consultants Stern Stewart & Company to identify and track sources of value creation that are not explained by traditional accounting and financial measures. While the acronym may be creative, EVA is simply a variant of the well-known concept called residual income.[9] It is simply the adjusted after-tax operating income minus a capital charge. Although the term EVA appeared in financial literature as early as 1989 (Finegan, 1989), it did not attract that much attention until an article appeared in *Fortune* magazine on September 20, 1993.[10] Nevertheless, Stewart's text was instrumental in promoting and advancing this new/old value-based metric.

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[7] Copeland et al. (1996).
[8] Stewart (1991).
[9] It is also called economic profit (EP). See, for example, Arnold (2005, p. 828).
[10] Tully (1993).

It goes without saying that all these books have contributed in one way or another to the promotion as well as to the popularizing of the SHV discipline. By so doing, companies have achieved a real and sustainable increase in their share value. The emergence of recent software (e.g., EVManager™ , FinanceAdviseor™ 2.0, CAPI Balanced Scorecard EVA Model, ART-EVA™) has allowed SHV to continue to advance as more and more companies, which previously had neither considered it nor felt competent or comfortable applying it, are now beginning to implement it.

It has long been argued that corporations should be run in order to maximise shareholder wealth. Black et al. (2001, p.257) stated that "The emergence of the SHV concept reinforces the message that companies have to improve their returns on invested capital as well as reduce their cost of capital." Friedman (1970), for example, affirmed this by suggesting that the firm's sole purpose should be to operate for shareholders. However, managing a company for value requires delivering a maximum return to the equity holders while balancing the interests of the other important constituents, including customers, employees, government, and suppliers. The proponents of the shareholder wealth approach frequently argue that maximizing shareholder value leads to the maximization of all stakeholder claims. The argument here is that by adopting the measures necessary to maximize corporate value, a company can advance the interest of other stakeholders as well as its shareholders. This also adds value to the society in which it operates. In the literature, this phenomenon has been linked to a win-win situation (Cooper, 2000, p.81).

When corporations correctly implement this strategy, not only do the shareholders benefit,

but everybody else does as well. The following quotation sums it up (Copeland et al., 1996):

> "Empirical evidence indicates that increasing shareholder value does not conflict with the long-run interests of other stakeholders. Winning companies seem to create relatively greater value for all stakeholders: customers, labor, the government (via taxes paid), and suppliers of capital. Yet, there are additional reasons—more conceptual in nature, but equally compelling—to adopt a system that emphasizes shareholder value. First, value is the best metric for performance that we know. Second, shareholders are the only stakeholders of a corporation who simultaneously maximize everyone's claim in seeking to maximize their own. And finally, companies that do not perform will find that capital flows toward their competitors."(p.22)

Similarly, in 1996, the CEO of Coca-Cola, the late Roberto C. Goizueta, argued the case for putting shareholders (or owners) interests first:

> "Saying that we work for our share owners may sound simplistic – but we frequently see companies that have forgotten the reason they exist. They may even try in vain to be all things to all people and serve many masters in many different ways. In any event, they miss their primary calling, which is to stick to the business of creating value for their owners... [While] a healthy company can have a positive and seemingly infinite impact on others, a sick company is a drag on the social order of things. It cannot sustain jobs, much less widen the opportunities available to its employees. It cannot serve customers. It cannot give to philanthropic causes. ...
>
> The real and lasting benefits we create don't come because we do good deeds, but because we do good work – work focused on our mission of creating value over time for the people who own the company."[11]

It can finally be concluded that the idea of a firm's operating to maximize shareholder value is not a new one, but this doctrine is only now gaining widespread acceptance. Rappaport (1998, pp.1-3) concedes that this is now being embraced as the

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[11] Remarks delivered to Executives' Club of Chicago, quoted in Coca-Cola Company annual report, 1996.

"politically correct" stance by corporate board members and top management in the United Kingdom, continental Europe, Australia, and even in Japan. However, in the United States, it has been a long established tradition. Rappoport also asserted that, as is the case with other good ideas, shareholder value has moved from being ignored to being rejected and then to becoming self-evident. Furthermore, he predicts that over the next ten years, shareholder value will more than likely become the global standard for measuring business performance.

2. 3 VALUE-BASED METRICS

Recent surveys have indicted the increasing importance of value-based metrics as benchmarks for assessing and managing corporate performance (see, for example, Ittner and Larcker, 1998; Black et al., 2001). In the past 10 to 15 years, many consulting firms have been caught up in a fierce competition to promote their service regarding value-based performance measures. They desperately try to capture the hearts, minds, and dollars of corporate executives. In an interesting article in the CFO magazine, Myers (1996) has dubbed this engagement as the "Metric Wars". Measures such as Economic Value Added (EVA), Market Value Added (MVA), Shareholder Value Added (SVA), Economic Profit (EP), Cash Flow Return on Investment (CFROI), Tobin's Q or Market to Book Value, Total Shareholder Return (TSR), and other value-based metrics are virtually all "rooted in the concept that companies should not look at reported earnings, which are subject to accounting distortions, but at how a company's returns exceed its cost of capital"(Myers, 1996, p.42). Money managers, business analysts, corporate executives, consultants, and

academics have increasingly utilized these metrics as they provide unique advantages over traditional accounting-based metrics such as EPS, ROA, ROE, or balance sheet ratios in reflecting value creation. In this section, six of the more popular value-based performance metrics are presented and discussed.

2.3.1 Economic Value Added (EVA)

More recently, Economic Value Added (or EVA) has been attracting considerable attention in the financial press and corporate world. Biddle et al. (1997, p.302), for instance, pointed out that citations of EVA in the business press have grown exponentially, rising from 1 in 1989 to 294 in 1996. *Fortune* magazine in its breaking article (Tully, 1993), branded EVA as "*the real key to creating wealth*". In August 1997, the *Economist* also published an interesting article about EVA, crowning it as "*a star to sail by*". As a new management tool to gauge corporate performance and value creation, it has been broadly accepted by a wide range of senior executives, financial analysts, and institutional investors. Moreover, an AICPA workshop on the future of financial management (April 1995) predicted that EVA would replace EPS (earnings per share) in *The Wall Street Journal's* regular stock and earnings report (Zarowin, 1995, p.48).

Today, in North America and around the world, a sizeable number of companies have adopted EVA as their key performance metric, even linking it to the fortunes of their executives. The growing popularity of EVA has also been reflected on the capital and money markets, where an increasing number of security analysts at brokerage houses are using EVA to pinpoint winners and losers (Topkis, 1996). Furthermore, as companies and

their officers are increasingly being held accountable for shareholder value, EVA, which forces managers to think and behave like shareholders, is becoming more and more a fundamental part of both running and judging a business.

The concept of EVA is neither new nor complicated. It dates back to Alfred Marshall, a famous English economist who, over 100 years ago, wrote that a firm, in order to create real earnings, must generate a profit in excess of its capital cost (Marshall, 1890). What Marshall was actually saying is quite simple. A firm can only create true value for its shareholders/owners, if and only if it is capable of making sound investment, financial, and operating decisions, which yield a return in excess of its cost of capital. If that is not the case; then there is no real profit or true value added to the business and, actually, from the shareholders' viewpoint, the company would thus be operating at a loss. This valuable insight of Marshall's has been a good management practice for business growth and survival since the beginning of last century.

It is interesting, though, to note that, the management guru, Peter Drucker, in the fifties as well as in a more recent 1995 *Harvard Business Review* article, reiterated this idea by saying that

> "Until a business returns a profit that is greater than its cost of capital, it operates at a loss. Never mind 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." (Drucker, 1995, p.59).

In the twentieth century, the concept of EVA was the object of extensive academic debate in the accounting and finance literature and it has been operationalized under

various labels including Residual Income (RI).[12] In the past several years, a US-based business consulting firm Stern Stewart & Company (hereafter referred to as Stern Stewart) has been promoting a variant of RI under the acronym of Economic Value Added or EVA as a tool for measuring corporate performance and value creation.[13] This new/old measure, though, is similar to residual income (RI), but distinguishes itself by a series of adjustments to eliminate potential distortions of accrual accounting as well as the inclusion of both debt and equity sources of capital in the calculation of cost of capital.[14]

According to Stern Stewart, EVA is defined as the difference between a firm's net operating income after taxes (NOPAT) and an appropriate charge for the opportunity cost of all capital invested in that firm (Stewart, 1991, pp.136-138). As such, EVA is a measure of a company's ability to produce an economic profit, that is, a return in excess of a firm's cost of capital. In equation form, EVA for a given year, t, can be expressed as follows:

$$EVA_t = NOPAT_t - [WACC_t \times TIC_{t-1}] = (ROIC_t - WACC_t) \times TIC_{t-1} \qquad (2.5)$$

where $NOPAT_t$ is the net operating profit after taxes, but before financing costs in year t; TIC_{t-1} is the economic book value of the total capital invested in the company, at the

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[12]Residual income (RI) is generally defined as what is left from accounting earnings after deducting a charge for invested capital to reflect a minimum required rate of return on the invested capital. Book value is used as the measure of invested capital. Thus, a firm's RI for any period is calculated as a product of the 'spread' between the firm's return-on-equity and its equity-cost-of-capital multiplied by the firm's accounting equity value at the beginning of the period. It is interesting, though, to note that General Motors applied a variant of this concept in the 1920s and General Electric coined the term '*residual income*' in the 1950s and used it to assess the performance of its decentralized divisions. See, for example, Bromwich and Walker (1998, p.392).

[13] EVA was commercially developed in 1982 by the Stern Stewart & Company. See Grant (2003, p.1).

[14] See, for example, Madden (1999, p.202).

beginning of year t, which includes both the interest bearing debt and equity[15] -- it stands as proxy for all cash invested in the company since its inception; $WACC_t$ is the weighted average cost of capital in year t, that is, the minimum rate of return demanded by both lenders and shareholders; $ROIC_t$ is the return on the capital employed in the company in year t and is calculated by dividing $NOPAT_t$ by TIC_{t-1}; [$ROIC_t$ - $WACC_t$] is the profitability spread; and [$WACC_t$ * TIC_{t-1}] is the annual capital charge, i.e., the cash flow required to compensate all the company's capital providers, equity as well as debt, for the risk of the capital that has been used during the year.

Thus, for an ongoing concern, a firm's EVA can be defined as the difference between its unlevered net operating profit after tax (NOPAT) and a dollar charge for the capital employed in the business—as measured by the amount of total invested capital (TIC) *times* the weighted average cost of capital (WACC). The NOPAT in the EVA model represents the total pool of profits available to provide a cash return to all financial providers of capital to the firm. It can be expressed in terms of the firm's pre-tax operating profit, EBIT, less unlevered operating taxes (T):

$$NOPAT = EBIT(1-T) = (S - CoGS - SG\ \&\ A\ Exp - Dep)(1-T) \tag{2.6}$$

As is shown in equation (2.6), EBIT is a function of the firm's sales (S) less expenses including cost of goods sold (CoGS); selling, general and administrative expenses (SG&A Exp); and depreciation (Dep). Unlike the operating profits calculated by many companies,

[15] It is important to note that Stern Stewart make a number of adjustments for their publicly available database as well as for their corporate clients not all of them available to the public.

both depreciation and business taxes (T) are subtracted from NOPAT because they are genuine economic costs that have to be managed (Ehrbar, 1998, p.131).

In turn, for a firm financed solely with debt and equity, the weighted average cost of capital (WACC), is defined as follows:

$$WACC = (W_D)(R_D)(1-T) + (W_E)(R_E) \tag{2.7}$$

where,

W_D = the proportion of total market value (debt plus equity) contributed by debt capital

W_E = the proportion of total market value (debt plus equity) contributed by equity capital

T =Tax rate

R_D = pre-tax cost of debt

R_E= cost of equity

Total invested capital (TIC)[16] is usually defined as the sum of the working capital requirement and net fixed assets. The working capital requirement consists of accounts receivable, inventories, net of accounts payable and accrued expenses. Taken together, these financial developments show that the firm's EVA can be expressed in basic terms as follows:

$$EVA_t = \left[S - CoGS - SG\ \&\ A\ Exp - Dep\right]_t (1-T) - [WACC_t \times TIC_{t-1}] \tag{2.8}$$

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[16] Also called "capital" or "capital employed".

The above EVA model (Eq. 2.8) demonstrates that EVA is a financial management system that integrates operating efficiency and balance sheet management into one easily accessible measure that can be understood by all managers and operating people. The model also shows that EVA is a performance metric that takes into account the cost of the capital the company employed -- a factor that no conventional measure such as accounting earnings, earnings per share (EPS), return on assets (ROA), or return on equity (ROE) includes. As a matter of fact, the opportunity cost of capital is what makes EVA a truly unique financial metric and an accurate gauge of business value.[17] By focusing on the profit remaining, after subtracting the opportunity cost for all capital employed, EVA shows the real return a company can get on investor dollars. With EVA technology in hand, investors have the upper hand. If, for whatever reason, a firm cannot generate enough return to cover its cost of capital; its investors will reduce the flow of capital to that company and more drastically re-price its stock downward to reflect their lower expectations.

The model also reveals that EVA is not only a measure of performance, but it is also a measure of value creation. It measures how and if a company creates true value for its shareholders. A company with a positive EVA creates value; a zero EVA maintains value; whereas a negative EVA suggests a squandering of value. In symbols,

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[17] It should be noted, however, that like EVA, the accounting metric Residual Income (RI), makes a cost of equity capital charge against the firm's profit to calculate what value is being generated over and above that required by the investors. However, RI is much less sophisticated not to mention less popular than EVA due to the absence of support by consultants as well as due to the fact that it lacks the necessary adjustments equired to both the balance sheet and the income statement figures to remove the accounting anomalies. See for example, Francis and Minchington (2000).

If [ROIC – WACC] x capital employed > 0 → value is created

If [ROIC – WACC] x capital employed = 0 → value is maintained

If [ROIC – WACC] x capital employed < 0 → value is destroyed

Stern Stewart and EVA proponents argue that EVA is much more than just a corporate metric. It is a modern management system that challenges a company to look hard at how it conducts and governs its business. Ehrbar (1998, p.5), for example, argues that EVA is definitely not another form of rightsizing or downsizing, nor is it a fad. It is a "fundamental way for measuring and managing corporate performance… It tells managers to do those things that they intuitively know are the right things to do, but that so often are obscured by conventional accounting-based measures of performance."

The appeal of EVA lies in its ability to integrate the often disparate management functions of strategic thinking, measuring performance, evaluating new investment opportunities, operating decisions, communicating with investors, and motivating employees. When EVA becomes the singular focus for all decisions, it establishes clear and accountable links among all corporate functions. CFO Basil Anderson of Scott Paper states:[18]

> "We used to have different financial measures for different purposes – discounted cash flow for capital decisions, another measure for rewarding performance and the like. …Now EVA is one measure that integrates all that. …it offers an excellent link to the creation of shareholder value."

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[18] Cited by Walbert (1995, pp.111-112).

Jim Meenan, CFO of AT&T's communications services group expresses a similar view:

> "Every decision is now based on EVA. The motivation of our business units is no longer just to make a profit. The drive is to earn the cost of capital. ...when you drive your business units toward EVA, you're really driving the correlation with the market value."(Walbert, 1995, p.112)

In fact, EVA is the only financial management system that provides a common language across all corporate functions. No other financial measure can do this. Figure 2 illustrates a typical financial management system where multiple measures and terminology are used to express financial goals and objectives. Usually, the end results of such a practice are confusion, inconsistent standards, and above all non-cohesive decision making. In contrast to this traditional system, Figure 3 shows how EVA can be used as a managerial tool to streamline and simplify the whole management process; thus providing a more consistent framework for decision-making. Needless to say, this type of consistency is of utmost importance as it unites and aligns the interests of all corporate employees—from CEO to CFO, to factory managers, to floor operators—with the overall goal of increasing shareholder wealth.

The most obvious way that EVA helps managers make better decisions for their companies is by charging their operations for the cost of all capital employed. The capital charge is, in fact, what sensitizes managers throughout a company to pay closer attention to the investment on hand. Indeed, EVA compels employees to use assets more diligently and efficiently. One company's experience with EVA, for instance, was summed up by Federal-Mogul's CEO Dick Snell in the statement:

"EVA accelerated our ability to divest assets and focus on our manufacturing core, to restore earnings improvements, and to begin to grow by acquisition. EVA was the criterion we used to evaluate each and every action—whether for rationalization, continuous improvement, or growth. With the clarity it provided, EVA allowed us to complete our evaluations quickly and move on to the next challenge. We are confident that EVA will continue to help all of us to make better business decisions, to build a world-class company, and to enhance shareholder wealth."[19]

In short, using a single financial tool, such as EVA, not only eliminates the type of confusion that CEO's and other senior executives are concerned about; but most importantly, it links all decision making to a common focus: how to improve EVA, and how to make companies more valuable.

Furthermore, as many CEO's are discovering, EVA can also be used to transform corporate culture, from top to bottom. For example, the CEO of Quaker Oats, William Smithburg who supported this notion, cited that "Our operating managers are much happier now that we have a single measure that embodies all of the things we want them to think about in running their business. Before, we used a whole variety of measures and procedures for different purposes, and that only served to confuse our managers rather than to clarify their mission" (Stewart, 1994, p.74). In this regard, EVA could spearhead a genuine revolution in management as it better answers the problems of how to align the interest of agents with principals and of how to bind managers and employees to the will of the shareholders (Ehrbar, 1998).

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[19] Cited by Ehrbar (1999), p.221.

Obviously, EVA isn't without some problems. In an attempt to allow EVA to approximate value maximization, Stern Stewart recommends making numerous adjustments to the accounting assets and NOPAT. These adjustments are necessary to eliminate any accounting anomalies introduced by GAAP, as well as to make EVA a more accurate period-to-period measure of performance and value creation. To date, Stern Stewart has identified and catalogued a total of 160 potential adjustments and they are primarily designed to reflect three purposes:[20]

a) To undo accounting conservatism;

b) To immunize performance measurement against past accounting "errors"; and

c) To make current EVA a better measure of market value.

Some of the more common adjustments proposed by Stern Stewart are listed below:[21]

- Capitalize R&D expenses.
- Capitalize operating lease expenses.
- Add back any inventory LIFO reserves.
- Add back deferred tax reserves.
- Add back bad debt reserves.
- Add back one-time restructuring charges.
- Add back amortization of goodwill.

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[20] For a complete discussion including some numerical examples, see Young and O'Byrne (2001, chapter 6); Grant (2003, chapter 9); O'Hanlon and Peasnell (1998); and Ehrbar (1998, pp.161-181).

[21] See Stewart, 1991, p.112.

While it is conceptually sound to adjust for various distortions as proposed by Stern Stewart, it has been correctly argued that most of these adjustments are fairly complicated and insignificant, some of them are even inconsistent with others, and above all many of them often call for excessive reliance on 'judgement'. As aptly put by O'Hanlon and Peasnell (1998, p. 442), "Stern Stewart appears to have devised the accounting adjustments, in an essentially ad hoc fashion, on the basis of consulting experiences, and the adjustments do not seem to be clearly underpinned by any formally expressed theory of income measurement or some would put it more bluntly, arbitrary decisions." At the Whirlpool Corporation, for instance, the merit of 160 adjustments was debated prior to implementation, and a decision was reached to make the adjustments only for factors that made a big difference. In the end, adjustments were made in only four areas: goodwill, capitalized leases, restructuring charges – which are each viewed as investment – and minority interests in investments.[22]

Apart from any further accounting difficulties that might arise when estimating NOPAT and TIC, in practice, many "cost of capital" issues remain debatable that can impact the estimation of EVA. These cost of capital challenges have both theoretical and empirical foundations that need to be tackled and resolved (e.g., Fabozzi and Grant, 2003). While estimating the cost of debt is fairly straightforward due to the fact that bond yields are readily observable; the measurement of the cost of equity poses estimation difficulties arising from the uncertainty surrounding the appropriate model and potential estimation errors whichever model is used. Despite all its limitations, recent reports have shown that

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[22] Cited by Shaked (1997, p. 3).

capital asset pricing model (CAPM) remains the most commonly used approach to estimate a firm's cost of equity.[23] The Sharpe-Lintner CAPM risk-return relation to estimate the cost of equity capital is an expectational model and its basic intuition can be summarized as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f] \tag{2.9}$$

where $E(R_i)$ denotes the expected return on asset i, R_f is the expected return on a risk-free asset (such as a government bond), $\beta_i = \text{cov}(R_i, R_m)/\text{var}(R_m)$ is a measure of volatility and it represents the sensitivity of the asset's return to variation in the market return. $E(R_m)$ is the long-term expected return on the stock market (e.g., S&P 500, FTSE-100, or some other market index). Thus, the expected return on a risky asset, such as an equity investment, equals the return on a riskless asset plus a risk premium. That risk premium can be obtained by multiplying the market risk premium [defined as the difference between $[E(R_m)\ and\ R_f]$ by the asset's market beta, β_i. Suffice it to say, that determining and properly calculating each of CAPM's components is crucial to the estimate of (R_i) and requires a good deal of judgment and interpretation which might somehow lead to differing conclusions (Young and O'Byrne, 2001). It is also important to note that in the CAPM, the risk-free rate and market risk premium are common to all firms; only beta varies across firms.

While CAPM is a widely used model for estimating the cost of equity, several empirical studies, most notably Fama and French (1992, 1993, 1995, 1996, 2004) have

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[23] See, for example, Bruner et al. (1998), Fama and French (2004), Rutterford (2000), and Graham and Harvey (2001).

raised doubts about the validity of the single-factor CAPM model as an accurate estimator of the cost of equity. Fortunately, financial economists and consultants have devised and proposed more sophisticated models that can be used to estimate a firm's cost of equity capital in lieu of the single-factor CAPM. Nevertheless, in the absence of other simplified models, CAPM provides a relatively good starting point for estimating the cost of equity (Perold, 2004; Palliam, 2006).

Furthermore, and as noted earlier, calculating EVA could provide a positive or negative dollar value, which indicates whether the firm earned an excess above its cost of capital during any given year. Critics of EVA claim that there are two problems with this annual dollar value of EVA (Reilly and Brown, 1997, p.741): First, how does one judge, over time, if the firm is prospering relative to its past performance? Although you would want the absolute EVA to grow over time, the question is whether the rate of growth of EVA is adequate for additional capital provided. Second, how does one compare EVA among companies or business units of different sizes? To rectify these problems, Stern Stewart proposed that EVA be standardized or normalized by dividing it by the capital outstanding at the beginning of the evaluation year, and multiplying by 100 (Stewart (1991), p.167). This effectively expresses EVA as a percentage of the beginning of year capital:

$$STANDARDIZED\ EVA_t = \left[\frac{EVA_t}{TIC_{t-1}}\right] = \left(\frac{NOPAT_t}{TIC_{t-1}} - WACC_t\right) \times 100 \qquad (2.10)$$

Clearly, one would want this EVA rate of return on capital to remain constant over time, or ideally to grow. Also, using this ratio one can compare firms of different sizes to determine which one has the largest economic profit per dollar of capital. This study uses the standardized EVA, that is, the annual EVA deflated by the beginning-of-year capital as the independent variable.

Last but not least, and despite theoretical arguments and some empirical evidence favouring the adoption of EVA worldwide, the implementation of this fairly sophisticated financial management system is less straightforward than one based on traditional accounting-based measures.[24] Moreover, a successful implementation of the EVA system requires, among others, long-term commitment from top management, and intensive training programs for employees. In an article published by Fortune magazine (1995), G. Bennett Stewart III, one of the originators of EVA and a senior partner at New York-based Stern Stewart & Company, refuted critics of EVA and argued that some of the common mistakes in implementing the EVA measure may lead to the failure of EVA (Stewart, 1995). He concisely outlined five pitfalls that companies may fall into when implementing EVA. If unaware of these traps; companies will pay the consequences. These are the following:

1) *Companies not making EVA a way* of *life*:

[24] It is interesting to note that in 1992 AT&T adopted EVA but subsequently abandoned it for variety of reasons. Some of the reasons for the EVA's demise are the complexity of the metric and the difficulty of communicating to employees the impact of their actions on the EVA metric combined with the hiring of a new CEO who had not championed the EVA system. For a discussion on AT&T's experience with EVA, see Ittner & Larckre (1998, pp.215-217).

Calculating EVA is probably an important step, but it is certainly not sufficient. EVA has to be the focus of a company's financial management system and be fully integrated into every management decision. EVA should never be a supplement to the reporting process, a line on the page, or one measure in a "balanced scorecard". It must be the bedrock upon which the entire reporting process is built. EVA must also constantly be reinforced in management meetings, training seminars, company newsletters, performance reviews, and in communications with external parties such as security analysts and the financial press.

2) *Companies trying to implement EVA too fast*:

Becoming an EVA company, simply, cannot be done overnight. The larger the company, the longer it will take to fully implement it. The changeover has to start with top management, and gradually work its way down through the ranks and it may take months or even a couple of years.

3) *Managers not being sure*:

Overpaid, mediocre or incompetent managers, who have an incentive plan that works for them, often resist the implementation of EVA. What incentives are there for them to switch to the EVA system, under which they will suddenly be held accountable for creating value? Thus, compensation and bonus determinations have to be tied to changes to EVA as a way to make it count.

4) *Managers creating too much fuss*:

When implementing EVA, many companies tend to make it into a big philosophical issue instead of keeping it simple. Managers get distracted by endless rounds of worthless discussion about what it means to create value for the shareholder as opposed to the

employee or the community at large. The bottom line of EVA is that it is beneficial for all the company's stakeholders, once it has been well integrated into the decision making process.

5) *Not enough training*:

Some companies do not widely disseminate EVA knowledge throughout the organization. To fully benefit from EVA, it is important to intensively train everyone in the organization because even those with the smallest jobs can help create value. Employees must understand how their unit EVAs will be calculated and how, in detail, the EVA numbers will be linked to compensation.

2.3.2 MARKET VALUE ADDED (MVA)

EVA is designed to be a single-period measure that tells what has happened to the wealth of shareholders. For publicly traded companies, Stern Stewart developed another measure that indicates whether or not a company has created an additional value to its shareholders' wealth. This cousin of EVA was termed 'market value added' or MVA in short and is defined as the absolute dollars spread between the current market value of the firm and the total capital that investors have committed to it since its formation (Stewart, 1991). In other words, MVA is the difference between cash in (what investors have contributed since the inception of the company) and cash out (what they could sell their claims for today). So, if a company, for instance, has a total market value of $10 million, and if it had invested only $8 million capital, then that company would have a $2 million

Market Value Added. If this same company, though, had invested $11 million capital, then its Market Value Added is a negative $1 million.

In calculating MVA, Stern Stewart first adds up all the capital taken in by a company during its lifetime through securities offerings, bank loans, and retained earnings. Second, it then makes some EVA-like adjustments (such as capitalizing and amortizing R&D expenditures) to eliminate any accounting anomalies.[25] These and other adjustments are necessary; in order to convert accounting book value into economic book value or what Stern Stewart calls 'adjusted book value'. In effect, the adjusted book value is what book value would be, if accountants were financial economists (Ehrbar, 1998). Then, third, it subtracts this adjusted capital amount from the current market value of both the company's debt and its equity.[26] In equation form, MVA is calculated as follows:

$$MVA_t = MV_{company,t} - BV_{assets,t} \tag{2.11}$$

where,

MVA = market value added

$MV_{company}$ = market value of company

BV_{assets} = Stern Stewart's adjusted book value of assets-in-place

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[25] Stern Stewart proposes a series of adjustments to the NOPAT and the book value with the intention of giving more economic meaning to EVA and the book value. For more detail, see Stewart (1991).

[26] The current market value of the firm being valued is based upon the market's perception of the firm's future performance. The equity figure is simply the stock price multiplied by the number of shares outstanding. The debt figure is the amount of outstanding debt owed to lenders.

Armed with the above definitions and given that the market value of a company can be expressed in terms of present value of all future cash flows and then in terms of the current book-value of assets-in-place plus the present value of all the EVAs it is expected to generate in the future, the MVA equation can subsequently be written as follows:[27]

$$MV_{company} = \sum_{t=1}^{\infty} \frac{FCFF_t}{(1+WACC)^t} = BV_{assets-in-place} + \sum_{t=1}^{\infty} \frac{EVA_t}{(1+WACC)^t} \tag{2.12}$$

$$MVA = MV_{company} - BV_{assets-in-place} = \sum_{t=1}^{\infty} \frac{EVA_t}{(1+WACC)^t} \tag{2.13}$$

where,

FCFF = free cash flow to the firm

WACC = weighted average cost of capital

MVA = market value added

$MV_{company}$ = market value of company

BV_{assets} = Stern Stewart's adjusted book value of assets-in-place

Stern Stewart argues, correctly, that the present value of all future EVAs constitutes the crucial difference between the book value of assets and the market value of the firm owing the assets. This excess is referred to as the firm's unrecorded goodwill, or MVA (O'Hanlon and Peasnell, 1998, p.425). The value creation can then formally be linked to EVA by assessing the excess of market value over book value as shown in Equation (2.13).

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[27] See for example O'Hanlon and Peasnell (1998).

Thus, maximizing the present value of the future stream of EVA amounts to exactly the same thing as maximizing intrinsic market value added.

As such, MVA is greatly influenced by a firm's EVA performance. If the PV of discounted future EVAs turns out to be negative which implies that the firm has not earned enough during the years to cover its cost of capital, then the company's value is expected to shrink. In contrast, if the PV of discounted future EVAs is positive, then the company will generate a positive MVA, which will increase the shareholders wealth. The following summarizes the major calculations:

$$\text{If} \quad \sum_{t=1}^{\infty} \frac{EVA_t}{(1+WACC)^t} > 0 \rightarrow \text{MVA} > 0 \rightarrow \text{wealth is created}$$

$$\text{If} \quad \sum_{t=1}^{\infty} \frac{EVA_t}{(1+WACC)^t} < 0 \rightarrow \text{MVA} < 0 \rightarrow \text{wealth is destroyed}$$

The interpretation of MVA is quite simple. A positive MVA signifies that a firm has created true wealth for its shareholders, since the company's market value is greater than the book value of the total capital employed in the business. On the other hand, when a firm has a negative MVA, its market value is less than the capital that shareholders and bondholders invested, meaning that its managers have destroyed capital and squandered shareholder wealth. From the standpoint of assessing the performance of current management, the change in MVA over a period of one year or five years can be more significant than the absolute level of MVA. Thus, to increase the spread between invested capital and market value should be the primary objective of any company concerned about

its shareholders' welfare (Stewart, 1991). Moreover, as the definitive measure of wealth creation and as the ultimate goal in the wealth creation game; MVA could be used to directly compare the performance of companies in different industries or even different countries (Ehrbar, 1998). For instance, MVA could be used to compare, say, a bank and a supermarket or a toy manufacturer and a food processor or a steel maker and a software company. Without a doubt, the one with the higher MVA created more wealth for its shareholders.

One of the best ways for companies to build MVA is to generate consistently positive EVA. EVA advocates argue that companies that rack up positive EVA year after year should see their MVA soar so their shareholder value would rise as well. Companies such as Coca-Cola, General Electric, Microsoft, and Wal-Mart have positive MVAs because their EVAs are both positive and are generally growing at an exceptional rate over time. In contrast, firms having negative EVA reports should see a noticeable decline in their equity values as the adverse EVA outlook lowers the intrinsic value of the firm (Grant, 1996; Ehrbar, 1998; Grant, 2003).

2.3.3 Tobin's Q (or Market to Book Value (MTBV))

Tobin's Q, a value-based metric named for its originator, James Tobin, a Yale University professor of Economics, has gained broad acceptance as a measure of corporate performance since its introduction roughly three decades ago into the financial economics

literature.[28] Defined as the ratio of the market value of the firm outstanding financial securities to the current replacement cost of its tangible assets, Tobin's Q is often used as a reliable measure of a company's growth opportunities and its ability to create long-run firm value. Its attractiveness results from its ability to provide an estimate of the firm's intangible assets, which include market power, goodwill, future investment opportunities, and high quality management; the greater the value of these intangibles, the greater the value of Q (Perfect and Wiles, 1994; Tobin, 1969). Thus, changes in Tobin's Q value provide an important indicator of corporate performance and value creation.

A growing number of empirical studies employed Tobin's Q metric to categorize companies according to their relative performance. Lindenberg and Ross (1981), for example, characterized companies with low Q ratios as competitive, tightly regulated, or in dying industries, while companies with high Q ratios tended to have unique products and factors of production. Likewise, firms with a Q ratio greater than one are judged as using scarce resources effectively; whereas those with a Q ratio of less than one as using resources poorly. Stated differently, Tobin's Q should be greater than 1.0, if the firm's return on its investments exceeds its cost of capital.

Landsman and Shapiro (1995) examined the relationship between Tobin's Q, return on investment (ROI), and economic return; and found that Tobin's Q is a better measure of firm's economic performance than other accounting-based measures. Tobin's Q is also gaining popularity as a tool for investigating whether a firm is more prone to take over. Lang, Stulz, and Walkling (1991) found that firms with low Tobin's Q are more likely to

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[28] For details, see Tobin (1969).

be taken over for purposes of restructuring and increasing value. In the literature, Tobin's Q definition may be stated as follows:[29]

$$Tobin's\ Q = \left[\frac{market\ value\ of\ the\ firm}{RVA}\right] = \left[\frac{MVCS + LVPS + BVD}{RVA}\right] \tag{2.14}$$

The numerator in the equation (2.14) consists of the aggregate year-end market value of common stock (MVCS), the liquidating value of preferred stock (LVPS), and the book value of debt (BVD). The denominator [the replacement value of assets (RVA)], is measured as the dollar outlay needed to purchase the current productive capacity of the firm at minimum cost with the most modern technologies available.

As an alternative to traditional performance metrics, Tobin's Q has several adherents in academia but, largely because of the unavailability of data, it still has not been able to break through into practical use (e.g., Damodaran, 2002, p.538). Moreover, Perfect and Wiles (1994) maintain that, although Tobin's Q is theoretically an attractive corporate performance measure, its estimation is subject to considerable measurement error. Shepherd (1996), for example, notes that, while the numerator supposedly represents the market value of the firm, only the market value of the common stock is commonly used. The remaining components are at their book values, or are arrived at using complex and debatable methods. Similarly, the construction of the denominator is controversial and contains an unknown amount of error as well as potential biases. Hence, combining two

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[29] See, for example, Perfect and Wiles (1994).

imperfect values results in a Q ratio with the possibility of considerable measurement errors.

While the numerator of Tobin's Q ratio is relatively easy to compute using data readily accessible from databases, the estimation of the replacement cost of assets (the denominator) is fairly complicated and, in many cases, hard to obtain due to the unavailability of data (e.g., Lewellen and Badrinath 1997). In an attempt to deal with this unavailability of data, several estimation techniques (proxies) have been proposed. Lindenberg and Ross (1981), for instance, developed one of the most popular ones. They divide the firm's assets into three components, namely plant and equipment, inventories, and other assets, and suggest an appropriate methodology for each. The replacement cost of plant and equipment is adjusted to account for four primary effects, including price level changes, real economic depreciation, technological changes, and investment in a new plant.

While Lindenberg and Ross's estimation technique may be theoretically superior, it is still difficult to put into practice. Hence, a simplified version has been adopted by a number of researchers including Lang and Stulz (1994) and Perfect and Wiles (1994). Moreover, in practice, analysts often use shortcuts to arrive at Tobin's Q, using market value of equity and debt as a proxy for the market value of assets and book value of assets as a proxy for replacement value. Thus, this proxy for Tobin's Q resembles the market-to-

book value (MTBV) ratio and is shown to be empirically closer to the more complex Lindenberg and Ross proxy:[30]

$$proxy\ for\ Tobin's\ Q = \frac{BVD + LVPS + MVCS}{BVTA} \tag{2.15}$$

where,

BVD = book value of debt

LVPS = liquidation value of preferred stock

MVCS = market value of common stock

BVTA = book value of total assets

2.3.4 Total Shareholder Return (TSR)

Total shareholder return or TSR is another value-based metric which measures the overall return for shareholders over a given period of time. It has been used for many years by investors and business analysts as a means of assessing performance and value creation. Moreover, TSR target has become an important element in determining executive pay (see Atrill, 2003, p.366). It is a comprehensive measure that reflects all activities or decisions taken by a management team and as such it has become an increasingly important indicator of managerial success (Arnold, 2005, p.854). *Management Today* (March 1997, p.48), for example, pointed out that "TSR reflects the measure of success closest to the hearts of a company's investors: what they have actually gained or lost from investing in one set of executives rather than in another."

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[30]See Chung and Pruitt (1994); and Perfect and Wiles (1994).

TSR shows the total return shareholders earned on their shares over a stated period of time, which in addition to the stream of actual dividend payments also includes capital appreciation or depreciation – any increases (or decreases) in the share price. For one-period TSR:[31]

$$TSR_t = \left[\frac{DPS_{t+1} + PPS_{t+1} - PPS_t}{PPS_t} \right] \times 100 \qquad (2.16)$$

where,

TSR_t = *total shareholder return*

DPS_{t+1} = *dividend per share at the end of the period*

PPS_{t+1} = *share price at the end of the period*

PPS_t = *share price at the beginning of the period (or initial share price)*

TSR is thus the most direct measure of changes in shareholder wealth over a given period of time, expressed in percentage terms (Young and O'Byrne, 2001, p.417). It has the benefit of being easily understood, and is more "dynamic" in that its values are constantly being assessed by the market. Furthermore, as no accounting information is included in this metric one may claim that it is independent of accounting policies (Whittington, 2000, p.360). TSR can be easily compared from company to company without having to worry about size bias. Recognizing this, the "*Wall Street Journal*" publishes a yearly report called "Shareholder Scoreboard" that ranks the 1000 major U.S. companies on TSR.

Similar to ROI, TSR, despite its appeal as a measure of shareholder wealth creation, is still considered flawed (Savarese, 2000, p.7). The calculated or absolute TSR

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[31] See, for example, Arnold (2002), p.677.

has little information value when taken alone. It does not indicate whether the return achieved is adequate, that is, is 20% for one particular company better than 15% for another company? A higher TSR does not mean that more shareholder wealth has been created. This deficiency can be mitigated by comparing the absolute TSR to a benchmark. Perhaps the best benchmark to use is the required return to equity; that is, the opportunity cost or the returns from comparable firms operating in the same industry over the same period of time.[32] Thus, to assess performance, the TSR metric should be used in conjunction with a benchmark to filter out economy-wide or industry-wide factors. A firm creates value for its shareholders if the TSR is greater than the required return to equity (Re), otherwise it destroys value. In symbols,

If TSR > Re → value is created

If TSR = Re → value is sustained

If TSR < Re → value is destroyed

2.3.5 The Cash Flow Return on Investment (CFROI)

Cash Flow Return on Investment (CFROI) model is another prominent value-based metric that is consistent with the principles of wealth maximization.[33] The model is rooted in the Internal Rate of Return (IRR) literature and was originally developed by Holt Value

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[32] The reason this benchmark is usually suitable is because it compares the returns generated by the firm with those generated by other investment opportunities that have the same level of risk. Other benchmarks would be industry averages and stock market indices such as S&P 500.

[33] For a complete and rigorous coverage of this metric, see Madden (1999).

Associates, a Chicago-based consultancy and it is now used by several well-known consulting firms, including the Boston Consulting Group (BCG), Price Waterhouse Coopers, Deloitte & Touche, and several others (Young and O'Byrne, 2001, p.381).

According to Madden (1999, p.13), CFROI is "an estimate of the real rate of return earned by a firm on all its assets, which can be thought of as a portfolio of projects." It can be obtained by finding the rate of return that equates the present value of the gross future cash flows available to the firm's debt and equity holders to the gross investment made by the capital owners. These cash flows are expressed in real (instead of nominal) terms by adjusting for period-to period changes in the general price level. In fact, adjusting for inflation is one of the distinctive selling features of CFROI as it facilitates comparisons across time and across countries.

As the term indicates, CFROI is the rate of return earned by the firm's existing projects. Differently put, CFROI is an IRR-type metric, which measures the expected rate of return over the average life of a firm's existing assets.[34] It is "an IRR measure but not in the traditional sense", say Peterson and Peterson (1996, p.26). The CFROI model functions as an economic, cash-based measure of corporate performance and is normally calculated on an annual basis. It should then be compared with the inflation-adjusted cost of capital, COC,[35] to determine whether a firm has earned returns superior to its cost of capital and thus created value for its shareholders. If CFROI is greater than the cost of capital

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[34] It is worth noting that this analysis can be done entirely in nominal terms where the internal rate of return is a nominal IRR and therefore is compared to the nominal cost of capital, or in real terms, in which case the internal rate of return is a real (inflation-adjusted) IRR compared to the real cost of capital.

[35] Inflation-adjusted COC = [(1+ nominal cost of capital) / (1+inflation rate)] -1

(sometimes called the *hurdle rate*), wealth is created; otherwise, wealth is destroyed if the CFROI has fallen short of the overall cost of debt and equity capital. In symbols,

If CFROI > Inflation-adjusted COC → value is created

If CFROI = Inflation-adjusted COC → value is sustained

If CFROI < Inflation-adjusted COC → value is destroyed

For a particular firm or project, CFROI can be calculated using the following inputs:[36]

i) The first input is the *gross investment* (GI) that the firm has in its existing assets, which is computed by adding back depreciation to the net asset value to arrive at an estimate of the original investment in the asset. The gross investment then is converted into a current dollar value by adjusting for inflation.

ii) The second input is the *gross cash flow* (GCF) earned each year over the expected life of the assets. This is usually calculated by adding non-cash charges such as depreciation and amortization to the after-tax operating income.

iii) The third input is the *expected life* of the assets-in-place (n).

iv) The non-depreciated assets which represent the *salvage value* (SV) or the expected value of the assets at the end of their useful life, in current dollars, is the final input.

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[36] See Damodaran (2001), pp.453-454.

The CFROI is thus the IRR of the above three cash flows and can be computed as follows:

$$Gross\ Investment\ (GI) = \sum_{t=1}^{n} \frac{GCF_t}{(1+CFROI)^t} + \frac{SV_n}{(1+CFROI)^n} \qquad (2.17)$$

CFROI is in fact an efficiency measure that compares future cash flows with the total investment employed to generate those cash flows. From the viewpoint of its users, CFROI is considered an informative and fairly useful metric for evaluating the true economic profitability of the firm's existing projects. Its usefulness lies in its ability to become an input into resource allocation decisions since, relative to the cost of capital, it very clearly defines which businesses (projects) are profitable and which are not as well as where investment is likely to create value.

As CFROI is based on both current and future cash flows, its advocates believe that the measure is more closely aligned with shareholder return. A study by the Chicago-based firm, Holt Value Associates,[37] showed a significant association between CFROI and stock prices over a 15-year period of analysis. According to this study, there was a 70% correlation factor between CFROI and stock prices, versus 31% for ROA and 44% for ROE. On the other hand, there was a zero correlation between earnings growth and stock prices. Needless to say, Holt is hardly unbiased and the study has yet to be examined by researchers and money managers. Furthermore, BCG/Holt claims that CFROI avoids the

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[37] "Best practice technique: Focus on CFROI analysis to boost your firm's growth in 2004." http://proquest.umi.com/pqdweb?did=466955401&sid=1&Fmt=4&clientId=10843&RQT=309&VName=PQD

distortions introduced by depreciation. This claim was countered by Stern Stewart on the basis that depreciation is implicit in all IRR measures, CFROI included (Stewart, 1994, pp.71-84).

It is, however, important to understand the limitations that CFROI has when used to measure performance and wealth creation.[38] In the academic literature and popular press, CFROI has been criticised for the following: First and foremost, its method of calculation, unlike its rival measures such as EVA, is quite complicated hence more difficult to explain to managers. Second, as a form of an IRR, CFROI, by itself, does not provide any indication as to whether a firm is creating or destroying shareholder value. For instance, is a CFROI of 11% good or bad? How much shareholder value has the firm created or squandered? Without a benchmark or reference to a company's real cost of capital, it would be impossible to answer these questions. Third, it requires one to make current-dollar adjustments, which results in a return on investment that is heavily sensitive to the quality of these adjustments. Fourth, like EVA, in practice, there are many accounting adjustments that can be made to estimate a firm's CFROI. However, the adjustments to EVA seem to make it more accurate, thus, more like a cash-based measure; whereas the adjustments made to CFROI appear to only make the measure more understandable. Last but not least, as CFROI is a non-linear measure, it may create a real communication issue among non-financial people. For example, how much would a manager need to improve the cash flow to obtain, say, a 10% increase in CFROI?

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[38] For more details, see for example, Young and O'Byrne (2001); Peterson and Peterson (1996); Clinton and Chen (1998); and Myers (1996).

2.3.6 The Balanced Scorecard (BSC)

A multi-dimensional framework for corporate performance known as "Balanced Scorecard", hereafter called BSC was developed and promoted by Kaplan and Norton (1992; 1993; 1996a; 1996b; 2001). It provides an integrated set of financial and non-financial measures that gives top managers a fast, but comprehensive view of a business. The financial measures include several accounting measures that report the results of actions that have already been taken (lagging indicators); whereas the non-financial measures encompass operational measures on customer satisfaction, internal processes, and the organization's innovation, growth, and learning activities which will eventually lead to improved financial performance in the future period (leading indicators).

By identifying and integrating both the financial and non-financial indicators of performance in a cause-and-effect relationship, the BSC becomes not only a performance management tool, but also a mechanism for translating strategy into action. Hence, the BSC has emerged as a strategic and control system that enables business units to evaluate their operations from at least four different perspectives, by addressing the following four questions (Kaplan and Norton, 1992, p.72):

1) How do we view shareholders? (Financial Perspective)
2) How do customers see us? (Customer Perspective)
3) What must we excel in? (Internal Business Perspective)

4) Can we continue to improve and create value? (Innovation and Learning Perspective)

Given the above four questions, Hoque and James (2000, pp.2-3) suggest the following key measures as indicators for the BSC usage.

- *Financial Perspective* - includes profitability such as operating income, return-on-capital employed, sales growth, generation of cash flow, or economic value added (EVA);
- *Customer Perspective* - encompasses such measures as customer satisfaction, customer retention, new customer acquisition, customer response time, market share, and customer profitability;
- *Internal-Business-Perspective* - the key measures include product design, product development, post-sales service, manufacturing efficiency, quality, etc.; and
- *Learning and growth perspective* – measures the ability of employees, information system, and organisational procedures to manage the business and adapt to change.

As Figure 4 shows that the balanced scorecard includes a mix of outcome measures or lag indicators and performance drivers or lead indicators. In practice, these indicators should be seen as a continuum. Kaplan and Norton (1996b, p.31) assume the following causal relationships: measures of organizational learning and growth → measures of internal business processes → measures of customer perspective → financial measures. For instance, customer satisfaction is a leading indicator of EVA, but it may also be a lag

indicator of on-time delivery. In other words, better on-time delivery improves customer satisfaction, which in turn leads to higher EVA. On the other hand, while on-time delivery is a lead indicator of customer satisfaction, it may also be a lag indicator of production cycle time as well as the quality of both the manufacturing process and the products themselves. Manufacturing process, product quality, rework rates, and cycle times are, in turn, lag indicators of employee skills and morale.

Unlike any other accounting or valued-based measure, the BSC does not provide an aggregate number for company value. Its purpose is not to measure company value, but to focus management on achieving the objectives that will result in value creation. Despite theoretical arguments and some empirical evidence favouring the adoption of BSC worldwide, the implementation of this fairly sophisticated performance system is less straightforward (e.g. Neely et al. 2004; Speckbacher and Pfeiffer 2003; Hoque and James 2000; Anand et al. 2005; Ax and Bjornenak 2005). The BSC is essentially a conceptual model, and as such, researchers and practitioners have difficulties defining measures as they are not clearly established (Ahn, 2001). It can be argued that Kaplan and Norton (1992, 1996) have provided a simplistic picture of complicated world. Therefore, many analysts have the feeling that, while the process of developing the balanced scorecard may be useful in identifying the value drivers of the company, the approach is difficult and awkward to measure and maintain. Its complexity and subjectivity, therefore, make it unsuitable as a compensation criterion (Morin and Jarrell, 2001, p.335).

Although the BSC has gained a great deal of attention among corporate managers as a performance measurement tool, little empirical evidence exists to substantiate claims

that it promotes superior financial performance compared to traditional performance measurement systems (e.g. Davis and Albright 2004; Maltz et al. 2003). The critics of the BSC approach also argue that it lacks a long-term perspective; the distinction between cause-and-effect is blurred; and it is difficult to achieve balance between the financial and non-financial measures. Norreklit (2000), for example, challenges the rationale of the assumed cause-and-effect relationship arguing that a cause-and-effect relationship should include a time lag between improving customers' satisfaction, learning and internal operations, and showing improvement on financial performance. Strack and Villis (2002) found that the BSC approach thrives in order to identify cause-and-effect relationship but the linkages established are mostly qualitative. Furthermore, researchers have noted that the BSC does not contain a human resources perspective which, arguably, is a desirable strategic dimension in any performance measurement system (Maltz et al. (2003). Nevertheless, the original appeal of the BSC approach for total business performance measurement was that it organized measurement under a small set of dimensions of business performance with which any manager could work, arguably (Kaplan and Norton, 1992).

2.4 The Association between EVA and Shareholder Value

In recent years, academics, corporate professionals, as well as the popular press have all shown great interest in the use of EVA as a measure of corporate success and value creation. A growing number of companies have adopted EVA or EVA-like measures as their key metrics for corporate performance and executive compensation. The

proponents of EVA have, consequently, come to realize it is the most reliable single-period indicator of shareholder wealth. Stern Stewart, the promoters of EVA, for example, have repeatedly asserted the notion that it is superior to traditional accounting-based measures in reflecting value creation. They have also proposed abandoning EPS, ROE and ROI which they deem to be "misleading measures of corporate performance".[39] They went even further to contend that "EVA is what drives stock prices".[40] As a means of providing support for this claim, Stern Stewart conducted several in-house studies to justify such an assertion. For example, Bennett Stewart III, a senior partner of Stern Stewart & Co., claims that:

> "EVA stands well out from the crowd as the single best measure of wealth creation on a contemporaneous basis ... [it] is almost 50% better than its closest accounting-based competitor in explaining changes in shareholder wealth ... [and] as such, it can be adopted with confidence as a company's primary internal financial performance metric" (Stewart, 1994, p.75).

However, surprisingly, to date, not enough empirical research has been done to support the above claims (e.g., Ittner & Larcker, 1998, p.210). The relatively few empirical studies that have addressed the issue, though, have provided some conflicting evidence about the usefulness of EVA as a measure of corporate success and value creation (eg., Biddle et al., 1997; Chen and Dodd, 1997).

Obviously, therefore, the superiority of EVA over commonly used performance metrics is an empirical issue that ought to be explored and examined. In an influential article published by *Fortune* magazine, Tully (1993) pointed out that EVA and stock prices

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[39] See Stewart (1991), p.66.
[40] Stern Stewart advertisement in *Harvard Business Review*, November-December, 1995, p.20.

show a remarkable tendency of moving up and down together. To support his assertion, Tully (1993, pp.43-44) quoted James Meenan, CFO of AT&T's long-distance firm, saying: "We calculated our EVA back to 1984 and found an almost perfect correlation with stock price." Not surprisingly, the very same author, five years later, in another article in *Fortune* magazine, reiterated his assertion that EVA is the best guide to stock prices and that it correlates far better with stock performance than EPS does (Tully, 1998). By the same token, Victor Rice, Chairman and CEO of Varity, a multi-billion dollar New York-based manufacturer of automotive components and diesel engines, noticed that "At Varity, EVA has become considerably more than just a yardstick. We fundamentally believe that, over time, there is a direct relationship between the improvement of EVA and a higher share price. So we have made EVA part of our mantra for building our corporate culture and creating wealth for shareholders" (Rice, 1996, p. 40).

Of course, Stern Stewart has also carried out a number of empirical studies on the relationship between EVA and MVA (e.g., Stewart, 1994; O'Byrne, 1996; O'Byrne, 1997; Ross; 1997; Uyemura, Kantor, & Pettit, 1996; Ehrbar, 1998). Using the Performance 1000 Database, they found that popular accounting based earning measures, including bottom-line net earnings after tax, earnings per share (EPS), and earnings growth rate, statistically only 'explain' about 20 percent of the changes in MVA recorded over the same period. It also found that the rate of return measures such as return on assets (ROA), return on equity (ROE), and return on net assets (RONA), do have more explanatory power, and account for about 35 percent of the changes in MVA. However, according to Stern Stewart's

analysis, EVA scored higher than all of the other measures, explaining nearly 50 percent of the variation in MVA (see Table 2.1).

In the words of Stern (1996, p.4), why the EVA correlation comes across as stronger is that "EVA, unlike ROE or RONA, takes into account the amount, as well as the quality of corporate investment. [It] corrects for accounting distortions in GAAP income statements and balance sheets, and specifies a minimum or required rate of return that must be earned on capital employed." The fact that EVA explains only 50% of the changes in MVA may not sound very impressive, but once we have ascertained that no other performance measure can explain as much of the change in MVA; it must be conceded that EVA is definitely on the leading edge. The studies of Stern Stewart also reveal that each $1 increase in EVA, on average, brings a $9.50 increase in MVA (Ehrbar, 1998, p.78). Of course, Stern Stewart is hardly unbiased and the studies have yet to be vetted by money managers and researchers.

In another research study, analyzing the computer industry from 1990-95, Milunovich and Tseui (1996) demonstrated the correlation between MVA and several other frequently used financial metrics (including EVA). They found EVA to correlate with MVA somewhat better than other performance metrics. According to their analysis, EVA was able to account for 42% of the variation in MVA. EPS growth for 24%, ROE for 29%, Free Cash Flow Growth for 25%, and Free Cash flow for 18%. Likewise, Uyemura, Kantor, and Pettit (1996) also studied the relationship between MVA and a variety of performance measures including EVA for the largest 100 bank holding companies over the ten-year period 1986 through 1995. They found that, among all the performance measures,

EVA had the strongest correlation to MVA. According to their study, the statistical correlation between these performance measures and MVA are: EVA 40%, ROA 13%, ROE 10%, Net Income 8%, and EPS 6%.

Zafiris and Bayldon (1999) have further contributed to the emerging literature on EVA/MVA, by improving EVA's applicability as an advance corporate measure over conventional accounting. The authors strongly believe that EVA has the potential to become the standard single-period criterion measure for decision making and performance evaluation. However, for this to happen, the authors suggest a simple, but rigorous approach to the EVA calculation based on up-to-date market values of the equity capital invested in the firm as opposed to book values. Unlike current practice in EVA measurement, the authors argue that this approach opens up "new ways of estimating relevant true opportunity costs generally making greater use of benchmarks derived from the competitive environment of the particular firm, as opposed to the firm itself."[41] Moreover, the authors drawing from the debates and concepts already established within the framework of neoclassical economics, have successfully put forward in the paper a version of the EVA criterion suitable for both decision making purposes (ex ante) and for measurement of achievement (ex post).

Using a sample of 452 firms during the period 1985-1994, Lehn and Makhjia (1997) examined the relationship between EVA/MVA and stock returns. They found that stock returns more highly correlated with average EVA than with other average traditional performance measures such as return on assets (ROA), return on equity (ROE), or return

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[41] See Zafiris and Bayldon (1999), p.95.

on sales (ROS). In addition, they found EVA performed somewhat better than accounting-based metrics in predicting CEO turnover. Likewise, Worthington and West (2004) used a sample of 110 Australian companies over the period 1992-1998 to examine whether EVA is more highly associated with stock returns than other traditional accounted-based measures. The authors found that stock returns are more closely correlated with EVA than residual income, earnings, and net cash flow, respectively.

In another attempt to assess the strength of the MVA and EVA relationship, Grant (2003) calculated regression statistics between the MVA-to-Capital ratio (dependent variable) and the EVA-to-Capital ratio (explanatory variable) for the 50 largest U.S. wealth creator corporations at year-end 2000. As expected, he found that a linear relationship exists between these twin measures of corporate performance and value creation. His evidence demonstrated that when the EVA-to-Capital ratio is large and positive; the corresponding MVA-to-Capital ratio will also be high and positive. Likewise, when the EVA-to-Capital ratio is low or negative, the corresponding MVA-to-Capital ratio is also low. These cross-sectional regression statistics reveal a statistically significant relationship between these two measures of corporate financial success. With an EVA "beta" (slope coefficient) of 35.93, and a t-statistic of 3.53, the EVA-Capital ratio for large U.S. wealth creators is a highly significant variable in the MVA equation (Grant, 2003, p.86).[42] The study also reveals that 19% of the movement in the MVA-to-Capital ratio among top-

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[42] The predicted MVA-to-capital ratios for these large capitalization firms were estimated:
MVA/Capital = 3.36 + 35.93 EVA/Capital
(t-value) (3.49) (3.53)
Adjusted R^2=19%
N=50 Firms

ranked U.S. firms at year end-2000 can be explained by contemporaneous variations in the EVA-to-Capital factor.

In yet another attempt to reassess the value relevance of EVA with respect to other performance metrics, Feltham et al. (2004) in a more recent study upheld the use of EVA. They tried to examine whether the results in Biddle et al. (1997) which suggested that earnings outperform EVA still hold true. To preserve the integrity of their analysis, authors replicated the exact statistical and econometrics procedures as Biddle et al., except with different sets of companies, different time periods, and different markets. The results of their replications, in general, were not consistent with the findings of Biddle et al. Thus, they disassociated themselves from Biddle et al's assertion and concluded that EVA does in fact beat earnings. However, Feltham et al. did suggest that the debate should be re-opened.

Further to this, certain studies have suggested another tack -- that EVA is predictive of stock returns. However, it is not the only performance measure tied directly to shareholder wealth as claimed by its proponents (e.g., Stewart 1991). Yet again, in still other cases, some studies have even found an adverse relationship between EVA and shareholder wealth. Using a sample of 566 companies from 1983-1992, Dodd and Chen (1996), for instance, found that return on assets (ROA) explained stock returns better than EVA with R^2 of 24.5%. The R^2 for other metrics showed that EVA accounted for approximately 20.2%; Residual Income for 19.4%; and ROA, EPS, and ROE for approximately 5-7%. Their empirical results demonstrated that stock returns and EVA per share are correlated as touted by EVA advocates; however, the association was far from

perfect. Clinton and Chen (1998) further compared EVA's ability to explain stock returns with a host of other "traditional reported, residual-based, adjusted, and cash-based" measures. Their findings also proved that EVA is the only measure that does not consistently reflect stock returns.

Biddle, Bowen, and Wallace (1997) found similar results. Their findings are overwhelmingly in support of a simple earnings measure. For example, they found that earnings are significantly more highly associated with market-adjusted returns (R^2 = 12.8%) than with residual income (R^2 = 7.3%), EVA (R^2 = 6.5%) or operating cash flows (R^2 = 2.8%). In their article, Biddle et al. performed a fairly comprehensive test on the value relevance of all the components of Stern Stewart's EVA. They broke down EVA into its component parts as follows:

$$EVA = CFO + Accruals + ATInt - CapChg + AcctAdj \tag{2.18}$$

where,

CFO = cash flow from operations

Accruals = accounting accruals, such as depreciation

ATInt = the after tax interest expenses

CapChg = the capital charge of all invested capital

AcctAdj = Stern Stewart's capital adjustments (i.e., asset re-valuation) and the adjustment of operating profits.

The authors examined the relative and incremental information content of each component of EVA in an attempt to find out whether EVA, or any of its components, is more highly associated with stock returns and firm value than accounting earnings, residual income, or cash flow from operations. They found that accounting earnings, in general, have the highest association with stock returns and firm value than EVA, residual income, or cash flow from operations. Moreover, they found that EVA components only add insignificant incremental value beyond accounting earnings in explaining stock returns. Consequently, they conclude that their findings reject the claim that EVA dominates earnings and suggest rather that earnings generally outperform EVA.

Chen and Dodd (1997), likewise, examined the explanatory power of various accounting measures such as EPS, ROA, ROE, RI, as well as various EVA related measures. Using a sample of 605 companies taken from the 1992 Stern Stewart 1000 database during the period spanning 1983–92, Chen and Dodd found that "EVA is a useful measure of corporate performance. However, EVA is neither as perfect as claimed by its advocates, nor is it the only performance measure that suggests a path to a superior stock return." (p.319)

2.5 Concluding Remarks

A review of the pertinent literature regarding performance measures and value creation is presented in this chapter. Particular attention is paid to the six most widely used and discussed value-based performance metrics in the business world and academic literature. It may be concluded that the existing bulk of empirical evidence indicates that

EVA's superiority over commonly used accounting and non-accounting-based performance measures has not yet been fully established. Hence, further empirical studies are warranted to explore this highly complicated issue in more depth.

CHAPTER 3

RESEARCH ISSUES AND HYPOTHESES

3.1 Introduction

The purpose of this study is to empirically test the hypothesis whether there is a significant statistical association between EVA and shareholder wealth. Economic Value Added (EVA), a surrogate for abnormal profit in the economist's sense, has received a great deal of attention as another new single-period criterion for decision making and performance evaluation (e.g., Zafiris and Bayldon, 1999). It has even been predicted that it will replace earnings per share (EPS) as the most valuable financial indicator in the Wall Street Journal's regular stock and earnings reports (Zarowin, 1995). Moreover, it has been repeatedly portrayed by Stern Stewart and other proponents as the key to creating shareholder wealth (e.g. Tully 1993; Ehrbar 1999; Grant 2003; Stewart 1991). Hence, it is important to empirically investigate how much EVA can explain MVA and to find out whether it is a reliable guide for achieving the goal of being able to maximize shareholder wealth. Two commonly-used performance measures, namely TSR and Tobin's Q are also considered in order to highlight the value-relevance of EVA vis-à-vis these measures.

The remainder of the chapter is organized as follows. Section 2 presents the empirical questions concerning the link between shareholder value (SHV) and various performance metrics, including EVA. Section 3 develops and identifies the main hypothesis of the study and the associated arguments about the link between EVA and SHV, and Section 4 concludes.

3.2 Research Issues

Academic literature indicates that links between various performance measures and shareholder value (SHV) are probable; however, this can only be definitively concluded by performing further empirical tests on these relationships. In order to determine whether there is any association between these measures and the market value of a firm, a direct link between alternative performance measures and the value created for shareholders should first be formulated. In this study, the firm's market value added or MVA would serve as the dependent variable in the various regression models and the regressions' R-squares (R^2) are then used as a gauge of the information's usefulness to the independent variables.

Several empirical questions concerning the link between shareholder value (SHV) and various performance metrics, including EVA will be developed and examined. This study is primarily intended to test whether a new value measurement paradigm such as EVA better explains the variation in market value added (MVA) compared to traditional value-based performance measures such as total shareholder return (TSR) and Tobin's Q. Thus, this study's analysis consists of three closely related empirical questions.

1) Does a statistical relationship between EVA and shareholder wealth exist, and if it does, how much of the variation of the shareholder value can be explained by EVA?

2) Does EVA dominate traditional value-based performance measures such as TSR and Tobin's Q in explaining contemporaneous MVA?

3) Do components unique to EVA, such as net operating profit after tax (NOPAT), return on invested capital (ROIC), cost of capital (WACC), and total invested capital (TIC) help in explaining contemporaneous MVA beyond the explanation given by traditional performance measures?

3.3 Research Hypotheses

Generally, in a regression model, the null hypothesis is set up as (H_0: $\beta_i = 0$). In our case, this means that the associated explanatory variable, that is, EVA has no effect on MVA (the dependent variable) and that knowledge of EVA would not help in explaining the variation in MVA. The alternative hypothesis is set up as (H_1: $\beta_i \neq 0$) which states that the slope of the regression line is not equal to zero; that is, EVA and MVA are linearly related. This implies that knowledge of the value of EVA does provide information concerning the associated value of MVA.

To address the previously mentioned research questions, this study examines the following hypotheses stated in the (alternative form).

3.3.1 Hypothesis One:

H1: Economic Value Added is significantly and positively associated with the firm's Market Value Added.

This hypothesis directly addresses the first study's question and examines whether there is a significant relationship between Economic Value Added and changes in

shareholder wealth. The coefficient on EVA metric is viewed as the weight that stock market attaches to this measure. A positive sign of the coefficient indicates that EVA is associated with the dependent variable. Consistent with prior empirical studies that evaluate alternative performance measures (e.g., Grant 1996, 2003; Kramer and Pushner 1997; Lehn and Makhija 1997), this study uses the association with the firm's Market Value Added (or MVA) as the criterion to determine the best measure.

This study hypothesizes that EVA is strongly and positively correlated with MVA and as such it provides additional information to explain the variation in the Market Value Added of the firm. This study's prediction is consistent with the theoretical valuation models in finance and accounting which suggest that various components of residual income should be associated with firm value in a manner that differs predictably in terms of both sign and magnitude of the association, and that they depend on the accounting and economic environments in which a firm operates (e.g., Livnat and Zarowin 1990; Barth et al. 1999).

3.3.2 Hypothesis Two:

H2: "EVA dominates value-based performance measures such as TSR and Tobin's Q in explaining contemporaneous MVA."

This study compares the value-relevance of EVA, TSR, and Tobin's Q in predicting MVA. It is hypothesized that the three value-based metrics are positively and highly correlated with MVA and as such could serve as important predictors of MVA. Moreover, the study is also predicting that EVA would outperform TSR and Tobin's Q in

explaining the variation in the market value added of the firm. This hypothesis is in line with recent studies finding that EVA is more highly associated with stock returns and firm values than accrual earnings, residual income, or cash flow from operations (e.g., Feltham et al. 2004; Lnhn and Makhija 1997; Worthington and West 2004).

3.3.3 Hypothesis Three:

H3: Components unique to EVA help in explaining contemporaneous MVA beyond the explanation given by value-based performance measures such as TSR and Tobin's Q.

This hypothesis assesses whether components unique to EVA model such as NOPAT, ROIC, WACC, and TIC have greater value-relevance (or information usefulness) over TSR and Tobin's Q in explaining the variation of the firm's market value added. The rational for decomposing EVA is to examine whether "aggregate" EVA masks much of the usefulness of its individual components, and whether the disaggregation of EVA improves the degree of association with MVA. Prior works suggest that EVA components add only marginally to information content beyond traditional accounting-based measures (e.g., Biddle et al. 1997). This study predicts that EVA components are expected to have incremental value-relevant information beyond that contained in TSR and Tobin's Q.

3.4 Concluding Remarks

The preceding chapter (chapter 2) focused on reviewing the theories and the empirical findings of other studies in the literature on performance measures and shareholder value creation. This chapter (3) has identified three hypotheses about the link between EVA and SHV. These hypotheses and their associated arguments were also highlighted and discussed. This study hypothesizes that EVA is strongly and positively correlated with MVA and as such it provides additional information to explain the variation in the Market Value Added of the firm. The study also predicts that EVA would outperform TSR and Tobin's Q in being able to explain the variation in the market value added of the firm. Finally, this study shows that EVA components are expected to have incremental value-relevant information beyond that contained in TSR and Tobin's Q.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

The previous chapter identified and discussed three empirical hypotheses about EVA and shareholder value creation. This chapter outlines and describes the research design and methodology used in testing the hypotheses. As well, it introduces the primary model and defines its variables. It also delves into the data sources and the specific regression models that link different performance measures to the dependent variable of MVA. This chapter is structured as follows: Section 2 delineates the data sources and the statistical techniques used in this study. In Sections 3 and 4, the primary models to test the empirical hypothesis are presented and their variables defined and explained in terms of their theoretical relevance. Concluding remarks are provided at the end of the chapter.

4.2 Data Sources and Statistical Techniques

Two separate sources of data have been used:

1) The 2002 US EVA/MVA Annual 1000 Ranking Database compiled by the New York-based financial consulting firm Stern Stewart & Co.
2) The DATASTREAM files.

The Stern Stewart Performance 1000 is a file that includes 20 years of historical annual data for MVA, EVA, NOPAT, Capital, Return on Capital, Cost of Capital, Market Value,

Company Type, Industry Index, and Three-Five- and Ten-year Shareholder Returns for 1000 top publicly owned US industrial and non-financial service firms (see Appendix C). The data is published on an annual basis and can be obtained from Stern Stewart & Co., New York.[43] Data for MVA along with EVA and its components over the period of 1991-2002 was taken directly from the Stern Stewart Excel file or calculated using data provided by this source. Furthermore, to obtain the data used to estimate Tobin's Q values and TSR, the DATASTREAM files were examined for those fiscal years.

This study uses panel data (or sometimes referred as pooled data) to test the research hypotheses. It can be considered an unbalanced panel data, since not all firms provide data for all years between 1991 and 2002. The panel data analysis is an advanced analytical technique that captures not only the variations of a single firm over time and variations of many firms at a given point in time, but the variations of these two dimensions simultaneously (e.g., Hsiao 2003; Baltagi 2001; Pindyck and Rubinfeld 1998). This simply means that panel data analysis combines both a cross-sectional data (N), and a time-series data (T) to produce a data set of (N x T) observations; where N can be a specific set of firms, households, countries, etc.[44]

In the last decade or so, panel data analysis has became central in quantitative studies. Its popularity has been greatly increased among social and behavioural science researchers and it became one of the most active and innovative bodies of literature in

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[43] http://www.sternstewrt.com

[44] Panel data usually refers to data which are cross-sectionally dominated; that is, where N is significantly larger than T. Such data usually have a fixed T, and the asymptotics are in N.

econometrics.[45]. For economists and social scientists, panel data sets provide several distinct advantages over conventional cross-sectional or time-series data sets. Baltagi (2001, pp.5-7), for instance, lists the following advantages from using panel data:

1) controlling for individual heterogeneity;
2) panel data provide a more informative data set, more variability, less collinearity among the variables, more degrees of freedom and more efficiency;
3) panel data are better able to study the dynamics of adjustment;
4) panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure time-series data;
5) panel data models allow us to construct and test more complicated behavioural models than purely cross-section or time-series data; and
6) panel data are usually gathered on micro units, like individuals, firms and households.

The data for this study are annual observations, collected over a period of 12 years on 1,000 firms, from 1991-2002. A pooled regression of observations from all 1000 firms and time period would yield estimates based on both firms and time periods. With N cross-sectional firms observed for T time periods the total number of observations in the data set will be N x T = 1000 x 12 = 12000 panel observations. Thus, the pooled data structure using firm-year as unit of analysis yield a substantially larger number of observations than is possible with either individual firm time-series or cross-sectional analysis.

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[45] See, for example (Greene, 2008; Dougherty, 2007).

4.3 Model Specification

It is worth noting that the purpose of this study is not to build an elaborate model for shareholder value, but only to examine and highlight the value-relevance of several performance metrics vis-à-vis EVA in predicting shareholder wealth. Hence, a sophisticated econometric analysis was not used, but only a combination of univariate[46] and multivariate regression analysis to perform the required tests.[47] The statistical models used in this study were an eclectic combination of models used by Biddle et al. (1997), Chen and Dodd (1997), and Kramer and Pushner (1997). The data for this analysis were two dimensional with respect to time and cross section. The model used in this study, therefore, had to include the same dimensions in order to produce a pooled design. All regressions were computed using the 'Regression" routine in STATA, version 9.1.

In this study, two regression models were suggested to test the empirical hypotheses. The first model examines the association between alternative corporate performance metrics and the MVA as well as highlights the value-relevance of these competing measures in explaining firm value and shareholder wealth (Hypothesis one and two).

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[46] A univariate model has only one right-hand-side variable.

[47] It is important to note that multivariate models allow us to estimate relations where two or more independent variables affect a dependent variable. On the other hand, the interpretation of the parameters of any multivariate regression are based on the *ceteris paribus* assumption—that one of the independent variables is changed, with all other held constant, to produce the measured effect on the dependent variable. For further information, see for example, Schmidt (2005).

$$MVA_{it} = \alpha_0 + \alpha_1 EVA_{it} + e_{it}$$

$$MVA_{it} = \beta_0 + \beta_1 TSR_t + u_{it}$$

$$MVA_{it} = \gamma_0 + \gamma_1 Tobin's\ Q_{it} + v_{it}$$

$$MVA_{it} = \pi_0 + \pi_1 EVA_{it} + \pi_2 TSR_{it} + \pi_3 Tobin's\ Q_{it} + \psi_{it}$$

The dependent variable here is the market value added (MVA) for firm i in period t. The explanatory variables in this model are: economic value added (EVA), total shareholder return (TSR), and Tobin's Q. Positive and significant coefficients are hypothesized. All variables in the above model are scaled by the beginning-of-period total invested capital (TIC_{t-1}) to mitigate heteroscedasticity.

The second model investigates whether EVA components can explain contemporaneous MVA beyond that explained by others performance metrics (Hypothesis three).

$$MVA_{it} = \beta_0 + \beta_1 profitability\ spread_{it} + e_{it}$$

$$MVA_{it} = \beta_0 + \beta_1 Lagged\ EVA_{it} + e_{it}$$

$$MVA_{it} = \beta_0 + \beta_1 total\ invetsed\ capital_{it} + e_{it}$$

$$MVA_{it} = \beta_0 + \beta_1 TSR_t + e_{it}$$

$$MVA_{it} = \beta_0 + \beta_1 Tobin'sQ_{it} + e_{it}$$

$$MVA_{it} = \beta_0 + \beta_1 profitability\ spread_{it} + \beta_2 Lagged\ EVA_{it} + \beta_3 total\ invested\ capital_{it} + \beta_4 TSR_{it} + \beta_5 Tobin'sQ_{it} + e_{it}$$

In this model, EVA is broken down into three components in order to evaluate the contribution of each toward explaining contemporaneous MVA. The dependent variable is

given as MVA. The explanatory variables are: profitability spread (or EVA spread),[48] lagged EVA (LagEVA), total invested capital (TIC), TSR, and Tobin's Q. All variables are as previously defined and are also scaled (normalized) by lagged total invested capital (TIC_{t-1}) to mitigate heteroscedasticity. To account for any non-normality in the variables, the values are expressed in natural logarithms. This model is also estimated using the pooled ordinary least squares regression and positive coefficients are hypothesized.

4.4 Research Variables

In addition to the dependent variable, Market Value Added (MVA), there are three categories of independent variables: Economic Value Added (EVA), Tobin's Q, and Total Shareholder Return (TSR). The following subsections describe all of these variables.

4.4.1 Dependent Variable:

The dependent variable chosen for this study is Market Value Added (MVA) -- a commonly used variable to measure corporate performance and value creation. As previously mentioned, MVA is a concept developed by Stern Stewart & Co. and may be defined as the aggregate net present value (NPV) of all the firm's activities and investments. It represents the value created (or destroyed) over the lifetime of a firm and can be seen as a proxy for the past and current value of the firm's strategies. MVA is

[48] Profitability spread (SPREAD) refers to the difference between the return on invested capital (ROIC), and the weighted average cost of capital (WACC), where ROIC is calculated by dividing NOPAT by total invested capital in the company at the beginning of the year. In literature, the spread between ROIC and WACC is often referred to as (1) the "residual return on capital," (2) the "surplus return on capital," (3) the "excess operating return on invested capital," as well as, (4) the "EVA spread". See Grant 2003, p.23.

calculated as the difference between total market value and total "economic" book value (capital). Total market value is defined as an approximation of the fair market value of a firm's entire debt and equity capitalization; whereas, total "economic" book value is defined as a firm's net assets with some adjustments (Stewart 1991; Stern 1996). This is expressed in the following equation: $MVA_t = MV_t - BV_t$; where MVA = market value added, MV = total market value of the firm, BV = total "economic value", and the t sub-script denoting the time-period.

MVA was chosen simply because it is a measure of value creation that reflects the cumulative wealth created and as such is expected to reflect both tangible and intangible value. It is superior to simple market value as a performance measure because it removes the capital employed in the firm away from the cumulative value created to demonstrate how well management has utilized its resources. One important methodology issue, though, is whether the level of MVA is influenced by the size of a firm. In order to control for a firm's size, MVA is scaled by dividing it by the total capital invested in the company at the beginning of the year (TIC_{t-1}) -- a variable that is available from the Stern Stewart 1000 database.

4.4.2 Independent Variables

The independent variables used in our analysis are: Economic Value Added (EVA); Total Shareholder Return (TSR); Tobin's Q or Market to Book Value (MBV); Net Operating Profit After Tax (NOPAT), Return on Invested Capital (ROIC), Weighted Average Cost of Capital (WACC), Total invested Capital (TIC), and Profitability Spread

(or EVA Spread). All these measures are frequently used in practice as corporate performance and value creation metrics.

Economic Value Added: EVA is a measure of true 'economic' profit, or the amount by which earnings exceed or fall short of the required rate of return that investors can expect to earn when investing in other assets of comparable risk. A senior partner and co-founder in Stern Stewart & Co., G. Bennett Stewart III, in his 1991 book '*The Quest for Value'*, defined EVA as the difference between a firm's net operating profit after tax (NOPAT) and an appropriate charge for the opportunity cost of all capital invested in that firm (Stewart, 1991). Since traditional earnings-based measures such as ROA understate the cost of capital by ignoring the opportunity cost of equity capital, EVA is designed to take this into account. EVA is calculated by multiplying the amount of invested capital (TIC) by the spread between the return on invested capital (ROIC) and the cost of capital (WACC), which is the required or minimum rate of return a firm must earn to compensate its investors for the risk they bear (Stern,1996). This is expressed in the following equation: $EVA_t = NOPAT_t - (WACC_t * TIC_{t-1}) = [ROIC - WACC]_t * TIC_{t-1}$; where NOPAT = net operating profit after tax, WACC = weighted average cost of capital, ROIC = return on invested capital = (NOPAT/ TIC_{t-1}), TIC = total invested capital, and the t sub-script denoting the time-period.

To properly estimate EVA, the total 'book capital' invested in a company as well as the after-tax operating income has to be adjusted. Table (4.1) shows Stern Stewart's "bottom up" and "top down" approaches to estimating a firm's unlevered NOPAT while Table (4.2) shows a list of potential adjustments in the equivalent "asset" and "financing"

approaches to estimating the firm's invested capital.[49] These adjustments are necessary to eliminate any potential anomalies that might be introduced by conventional accounting practices and are intended to produce an adjusted balance sheet that reflects the economic value of assets-in-place more accurately than the inherently conservative, historical-cost-based balance sheet guided by GAAP. Like the MVA case, the information about EVA is also obtained from the Stern Stewart 1000 Database.

Tobin's Q or Market-to-Book Value (MBV): Tobin's Q is a measure of the real value created by management and is defined as the ratio of the market value of a firm to the replacement cost of its assets. However, because of the unavailability of data, the calculation of the "Q" value has been rendered too complex and cumbersome (e.g., Damodaran, 2002). Therefore, several proxies for Tobin's Q have been suggested in the literature (e.g., Chung & Pruitt 1994; Perfect and Wiles 1994). One approximation that seems to be empirically close to the "Q" value obtained via the Lindendberg and Ross' model[50] is a proxy given by Chung and Pruitt (1994): $Approximate\ Q_t = (MVE_t + PS_t + DEBT_t)/BTA_t$; where, MVE is the product of a firm's share price and the number of common stock shares outstanding; PS is the liquidating value of the firm's outstanding preferred stock; DEBT is the value of the firm's short-term liabilities net of its short-term assets, plus the book value of the firm's long-term debt;

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[49] For a more comprehensive discussion of EVA-based accounting adjustments, see Stewart (1991).
[50] See Lindenberg and Ross (1981).

BTA is the book value of the total assets of a firm; and the t sub-script denoting the time-period.

In this approximation, Tobin's Q is the ratio of the market value of a firm to total assets and as such differs from the Lindendberg and Ross model in that approximate "Q" implicitly assumes that the replacement values of a firm's plant, equipment, and inventories are equal to their book values. Clearly, the simplified procedures involved in the calculation of approximate "Q" represent a compromise between analytical precision and computation (Chung and Pruitt 1994). On the other hand, all the required inputs to calculate this ratio are readily obtainable from a firm's basic financial and accounting information, so the DATASTREAM file has been used as the data source for the calculation of each firm's Q ratio.

Total Shareholder Return: The TSR metric is the most direct measure of changes in shareholder value over a given period, expressed in percentage terms. It can be easily compared from firm to firm, and benchmarked against industry or market returns, without having to worry about size bias (Young and O'Byrne 2001). Shareholders can earn a return on their investment in two ways: through dividends and through stock price appreciation or depreciation. Over a given period of time, t, the total shareholder return (TSR) for firm 'j' can be specified as: $TSR_{jt} = [DPS_{jt+1} + PPS_{jt+1} - PPS_{jt}] / PPS_{jt}$; where DPS_{jt+1} = dividends per share paid at the end of period t, PPS_{jt} = price per share at the beginning of period t, and PPS_{jt+1} = price per share at the end of period t. The DATASTREAM file has been used as the data source for the calculation of TSR.

4.5 Concluding Remarks

The purpose of this chapter is to describe the research methodology and the sources of data that were used in this study. The first section has been dedicated to describing the databases, the sample, as well as the rationale behind the statistical techniques that were implemented in this study. The second section of this chapter specifies the empirical model employed to investigate the usefulness of EVA as a measure of performance and value creation. The third section was devoted to describing the measurement of variables. The following chapter provides descriptive statistics on select variables and reports on and discusses the empirical results of testing the research hypotheses.

CHAPTER 5

DATA ANALYSIS AND PRESENTATION OF STATISTICAL RESULTS

5.1 Introduction

While chapter 4 introduced the statistical models used in this study on EVA and defined their variables, this chapter further studies the relationship between EVA and SHV by testing the proposed statistical models using regression analysis. The empirical analysis of this thesis focuses on the contemporaneous relationship between MVA and three commonly used performance metrics with the primary focus being on EVA. Specifically, this thesis investigated the value-relevance[51] of these competing performance metrics in explaining SHV. Therefore, the thesis has provided empirical evidence whether the current period realization of EVA is more closely associated with SHV than are other traditional performance measures such as TSR and Tobin's Q.

This chapter then provides descriptive statistics on selected variables as well as reports on and discusses the empirical results that stem from the testing of the research hypotheses. Starting with descriptive statistics, the distribution of the data in terms of the means and the standard deviations has been examined closely. Further to this, the idea asserted by EVA's proponents that it is a superior measure of shareholder value creation

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[51] Also called "information content", see for example Biddle et al. (1995).

was also tested empirically. Finally, concluding remarks are provided at the end of the chapter.

5.2 Descriptive Statistics

As previously mentioned, the empirical tests in this study rely on a pooled desig.. and the data were analysed by the econometric software named STATA (Version 9.1). The data are annual observations, collected over a period of 12 years of 1,000 firms, from 1991-2002. The dependent variable for this study is MVA and the explanatory variables are a set of performance metrics including EVA. These variables calculated on a twelfth-year average basis resulted in a final usable pooled data sample of 8945 year-firm observations.

Table 5.1 presents the means and the standard deviations for the primary variables examined in this study. From the Table, it should be noted that while MVA and NOPAT are positive on average (about $5266.249 million and $401.9223 million respectively), the mean level of EVA is negative (-$81.15118 million), which demonstrates the significance of the cost of capital (WACC) and implies significant growth expectations for future EVA. On the other hand, Table 5.2 illustrates the relationship between MVA and the independent variables. The correlation coefficients thus reveal a significant association between MVA and all of the EVA variables, suggesting that EVA and its components separately yield information that is perceived important by the stock market, a rightful claim by EVA advocates. Nevertheless, the relationship between MVA and the EVA measure is far from perfect. A correlation of 0.6102 between MVA and EVA indicates that increasing EVA

alone is not all that matters in the marketplace since only 37.23% of the variation in MVA can be explained by the measure.[52]

5.3 Test of Hypothesis

The objective of this study is to test the hypothesis that EVA is highly associated with MVA. It is not the purpose here, though, to explain the determinants of MVA, but only to show how well EVA acts as a genuine explanatory variable for MVA, in order to justify its appropriateness for performance measurement, CEO compensation, financial reporting, and shareholder value creation. As such, sophisticated econometric models or adjustments have not been employed, but instead a combination of univariate and multivariate regression analysis was used to compare EVA with other single-period performance measures.

5.3.1 Hypothesis One

"Economic Value Added is significantly and positively associated with the firm's Market Value Added."

Hypothesis 1 was tested using the following univariate regression model with the dependent variable of MVA scaled by beginning-of-year invested capital (MVA_{it}/TIC_{it-1})

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[52] In the regression context, the coefficient of determination (R^2) is a more meaningful measure than the coefficient of correlation (R). The former tells us the proportion of variation in the dependent variable explained by the explanatory variable (s) and therefore provides an overall measure of the extent to which the variation in one variable determines the variation in the other. The latter does not have such value. Also note that R^2 can be computed as the squared coefficient of correlation (R). See for example, Gujarati (2003).

and the independent variable of EVA scaled by beginning-of-year invested capital (EVA_{it}/TIC_{it-1}).

$$sMVA_{it} = \beta_1 + \beta_2 sEVA_{it} + e_{it} \qquad (5.1)$$

where,

MVA_{it}= market value added for firm i in period t

$sMVA_{it}$ =standardized MVA=(MVA_{it} / TIC_{it-1})

EVA_{it}= economic value added for firm i in period t

$sEVA_{it}$=standardized EVA=(EVA_{it} / TIC_{it-1})

TIC_{it-1}=total invested capital for firm i in period t-1

e_{it}= is a random disturbance term $\left|N(0,\sigma^2\right|$

This model was estimated using a pooled least square regression. The overall model yielded a positive and statistically significant coefficient of 10.33 and an R^2 of 0.3724 for the entire sample (see Table 5.3, Panel A). This upholds Hypothesis 1 that EVA is positively and significantly related to MVA. The very low p-value (0.000) implies that the EVA coefficient is statistically significant – a result that allows for the null hypothesis to be rejected in favour of the alternative hypothesis. Moreover, the positive sign on the EVA coefficient along with sufficiently high t-statistics of 75.34 indicates that EVA has a strong effect on MVA. For each dollar increase in EVA, there would be $10.33 increase in MVA. This should come as no surprise as a number of past empirical tests of the relationship between EVA and MVA show similar results. For example, in one of Stern Stewart's

studies using the Performance 1000 Database, EVA was found to statistically 'explain' about 50% of the changes in a company's MVA. The research also showed that each $1 increase in EVA brings, on average, a $9.50 increase in MVA (Ehrbar, 1998, p.78).

While these results are significant, much of the variation of MVA remains unexplained. In order to obtain more insight into the strength of EVA as a proxy for MVA, an ordinary least squares regression was performed with net operating profits after taxes (NOPAT) as an independent variable:

$$sMVA_{it} = \beta_0 + \beta_1\ sNOPAT_{it} + e_{it} \qquad (5.2)$$

where,

MVA_{it}= market value added for firm i in period t

$sMVA_{it}$ =standardized MVA=(MVA_{it} / TIC_{it-1})

$NOPAT_{it}$= net operating profit after tax for firm i in period t

$sNOPAT_{it}$ =standardized NOPAT=($NOPAT_{it}$ / TIC_{it-1})

TIC_{it-1}=total invested capital for firm i in period t-1

e_{it}= is a random disturbance term $\lfloor N(0,\sigma^2 \rfloor$

The results are summarized in Table 5.3, Panel B. Compared to Table 5.3, Panel A, it can be seen that the level of MVA is positively related to both EVA and NOPAT in the same periods. However, NOPAT explains slightly more of the total variation in MVA than EVA

does.[53] This suggests that the level of NOPAT is not only a better proxy, but it is also a better predictor of corporate performance than the level of EVA.

5.3.2 Hypothesis Two:

"EVA dominates value-based performance measures such as TSR and Tobin's Q in explaining contemporaneous MVA."

To test for the incremental value-relevance (also called information usefulness or content) of economic value added (EVA) over the value relevance of total shareholder return (TSR) and Tobin's Q, the following multivariate regression model was used:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln EVA_{it} + \beta_2 \ln TSR_{it} + \beta_3 \ln Tobin's\ Q_{it} + e_{it} \qquad (5.3)$$

This model was also estimated using a pooled least square regression. The dependent variable was MVA for firm (i) in period (t); whereas, the explanatory variables were EVA, TSR, and Tobin's Q. To account for any non-normality in the variables, the values are expressed in logarithms. Both the dependent and the independent variables were normalized by the beginning-of-year invested capital to reduce heteroskedasticity.

Table 5.4, Panel A, shows the estimated coefficients, standard errors, t-statistics, F-statistic, and R-square for this model (Eq.5.3) and indicates that all three performance metrics, that is, EVA, TSR, and Tobin's Q are positively associated with changes in shareholder value (MVA). The coefficients for EVA, TSR, and Tobin's Q are 0.2410,

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[53] Since the only difference between EVA and NOPAT is the cost of capital (COC), results favouring NOPAT may be attributable to mis-estimation by Stern Stewart of the cost of capital (potentially from using a CAPM approach to estimate the cost of equity). See for example, Kramer and Pushner (1997) and Zafiris and Bayldon (1999).

0.07629, and 0.2897 respectively and all are significant at 5%. To assess or check for multicollinearity, Belsley (1991) and Belsley et al. (1980) recommend looking at '*the condition number' or* γ, which is the square root of the ratio of the largest to smallest characteristic root:

$$\gamma = \left(\frac{\max \textit{root}}{\min \textit{root}} \right)^{1/2} \tag{5.4}$$

Belsley et al. suggest that condition numbers larger than 30 indicate serious multicollinearity, while numbers larger than 100 imply severe multicollinearity.[54] Some researchers use the Variance Inflation Factor (VIF) as an indicator of multicollinearity.[55] The VIF is a measure of the strength of the relationship between each explanatory variable and all other explanatory variables in the regression and can be defined as:

$$VIF_j = \frac{1}{(1 - R_j^2)} \tag{5.5}$$

It shows how the variance of an estimator is inflated by the presence of multicollinearity. If there is no collinearity (ideal case), then $R_j^2 = 0$ and VIF will be 1. As a rule of thumb, if the VIF of an independent variable exceeds 10, a severe multicollinearity problem may be indicated. Finally, one can use the inverse of the VIF, which is called Tolerance (TOL). That is,

$$TOL_j = \frac{1}{VIF_j} = (1 - R_j^2) \tag{5.6}$$

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[54] For further details, see Greene (1993), p.269.
[55] See, for example, Dielman (2005), pp.161-164.

Thus, when $R_j^2 = 1$ (i.e., perfect collinearity), $TOL_j = 0$ and when $R_j^2 = 0$ (i.e., no collinearity whatsoever), $TOL_j = 1$. In other words, the closer TOL_j is to zero, the greater the degree of collinearity of that variable with other regressors. Because of this intimate connection between VIF and TOL, researchers, quite often, use them interchangeably.

Examination of the VIF reveals that there is no serious multicollinearity problem in the regression model. As shown in Table 5.4, Panel B, the highest VIF in this model is (1.28). This suggests that, while multicollinearity, exists, it does not pose a problem. Again as summarized in Table 5.4, the results of this regression not only provided strong evidence of the significance and direction of the relationships as previously hypothesized; but also established a baseline by which to analyze the incremental value-relevance of EVA.

As previously mentioned, the data under study is panel data sometimes referred as pooled data and consists of a combination of time-series and cross-sectional data. The two most frequently estimation techniques used are the Fixed Effects Model (FE) and the Random Effects Model (RE) (see, Wooldridge, 2002). To choose between the fixed or random-effects models, the Hausman (1978) specification test was used. The test statistic is asymptotically distributed as Chi-Squared and the test is based on the Wald criterion (Greene, 1993, p.480). The null hypothesis underlying the Hausman test is that the fixed and random specifications are consistent, whereas under the alternative, the fixed effect model is, but the random effects model is not. As can be seen from Table 5.5, the test statistic works out to 57.04 and the critical value for 3 degrees of freedom is smaller than

this; it is 7.81.[56] The Hausman statistic rejects the null hypothesis for our model (equation 5.3) at the 0.05 level, and hence the conclusion is that the random-effects model is not appropriate so we would be better off using the fixed-effects model in the value-relevance tests.

Following the value-relevance literature (e.g., Biddle et al. 1995, 1997; Chen and Dodd 1997; Worthington and West 2004; Bao and Bao 1998; Feltham et al. 2004), hypothesis 2 was tested using a two step process. For the first step, the value-relevance of each of the three explanatory variables; that is, EVA, TSR, and Tobin's Q was evaluated. To accomplish this, each of these three variables was specified as the explanatory variable in separate univariate regressions with MVA as the dependent variable:

$$\ln MVA_{it} = \alpha_0 + \alpha_1 \ln EVA_{it} + e_{it} \tag{5.7}$$

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln Tobin's\ Q_{it} + u_{it} \tag{5.8}$$

$$\ln MVA_{it} = \gamma_0 + \gamma_1 \ln TSR_{it} + v_{it} \tag{5.9}$$

Value-relevance was, then, assessed by comparing R-squares for the three regressions. Table 5.6 (Panels A, B, and C) displays the results of the regressions and shows that EVA has the greatest value-relevance as it possesses the greatest information power in explaining the variation in the MVA. The main observation is that EVA has a significantly larger R-square (39.12%) than that of Tobin's Q and TSR. Tobin's Q in return has a significantly higher R-square (34.80%) than that of TSR (5.70%). Meanwhile, the univariate coefficients of the three variables (EVA, Tobin's Q, TSR) are positive and

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[56] Chi-square critical values are from Schmidt (2005), p.405.

significant (α=0.3325, t=28.28; β=0.4931, t=39.63; γ=0.1202, t=10.53; respectively), indicating that these variables are relatively reliable predictors of shareholder value. These results are further confirmed by the multivariate regression (Equation 5.3) as previously stated.

In the second step, a set of tests was conducted to find out which of the three predictors of shareholder wealth provides value-relevance data beyond that provided by other measures. In these tests, each of the three explanatory variables was paired alternately with each other in a multivariate regression. For example, the incremental value-relevance for EVA over TSR is obtained from a multivariate regression where both EVA and TSR are specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(EVA_{it}) + \beta_2 \ln(TSR_{it}) + e_{it} \qquad (5.10)$$

Taking the R-square from this pair-wise regression (Equation 5.10), and subtracting the individual R-square for TSR obtained in the earlier univariate regression (Equation 5.9), yields the incremental value-relevance of EVA over TSR. Likewise, the incremental value-relevance for EVA over Tobin's Q is obtained from a multivariate regression where both EVA and Tobin's Q are specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(EVA_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it} \qquad (5.11)$$

Taking the R-square from this pair-wise regression (Equation 5.11), and subtracting the individual R-square for Tobin's Q obtained in the earlier univariate regression (Equation 5.8), yields the incremental value-relevance of EVA over Tobin's Q. Similarly, the incremental value-relevance for Tobin's Q over TSR is obtained from a multivariate regression where both Tobin's Q and TSR are specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \ln \beta_1 (Tobin's\ Q_{it}) + \beta_2 \ln(TSR_{it}) + e_{it} \qquad (5.12)$$

Taking the R-square from this pair-wise regression (Equation 5.12), and subtracting the individual R-square for TSR obtained in the earlier univariate regression (Equation 5.9), yields the incremental value-relevance of Tobin's Q over TSR.

As can be seen in Table 5.6 and 5.7, EVA is the most significant explanatory metric by itself or when paired with Tobin's Q. The pair-wise combinations that most explain MVA, in order of decreasing power, are EVA/Tobin's Q (52.93%), EVA/TSR (42.11%), and Tobin's Q/TSR (35.66%). Once again, as hypothesized, the comparison of regressions provides strong evidence of the relative value-relevance of the EVA metric over TSR and Tobin's Q in explaining shareholder wealth.

The results in Table 5.8 Panel C provide incremental value-relevance tests for the pair-wise combinations of EVA, TSR, and Tobin's Q. For example, the incremental value-relevance of EVA over TSR (36.41%) can be quantified by comparing the R-squares of the two regressions: The value-relevance of the pair-wise comparison of EVA and TSR (42.11%) from Table 5.8 Panel B minus the value-relevance of TSR (5.70%) from Table

5.8 Panel A. Likewise, the incremental value-relevance of EVA over Tobin's Q (18.13%) can be calculated by comparing the R-squares of two regressions: The value-relevance of the pair-wise comparison of EVA and Tobin's Q (52.93%) from Table 5.8 Panel B minus the value-relevance of Tobin's Q (34.80%) from Table 5.8 Panel A. The pair-wise combinations of (EVA/ TSR) and (EVA/Tobin's Q) indicate that explanatory power has increased by 36.41% and 18.13% respectively over the EVA measure alone.

As summarized in Table 5.8, the overall results indicate that EVA exhibits the largest relative and incremental information usefulness over TSR and Tobin's Q. These results convincingly support the claims made by EVA proponents that EVA outperforms other performance measures in explaining shareholder wealth.

5.3.3 Hypothesis Three

"Components unique to EVA help to explain contemporaneous MVA beyond the explanation given by value-based performance measures such as TSR and Tobin's Q."

To test for the incremental value-relevance of EVA components over the value relevance of TSR and Tobin's Q, the following multivariate regression model was used:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(total\ invested\ capital_{it}) + \beta_3 \ln(Lagged\ EVA_{it}) + \beta_4 \ln(TSR_{it}) + \beta_5 \ln(Tobin's\ Q_{it}) + e_{it} \quad (5.13)$$

This model was also estimated using a pooled least square regression. The dependent variable was MVA for firm (i) in period (t), and the explanatory variables were Profitability Spread (PS), Total Invested Capital (TIC), Lagged EVA (Lagged EVA), Total Shareholder Return (TSR), and Tobin's Q. Profitability Spread, TIC, TSR, and Tobin's Q are as previously defined. Descriptive statistics are displayed in Table 5.1. To account for any non-normality in the variables, the values are expressed in natural logarithms.

As reported in Table 5.9, Panel A, the results of this regression indicate a positive and significant relationship to all of the independent variables with an overall R-square of 0.4724. The estimated slope coefficients for profitability spread, TIC, Lagged EVA, TSR, and Tobin's Q are 0.1293, 0.3064, 0.0481, 0.0841, and 0.2506 respectively and all are significant at 5%. Examination of the Variance Inflation Factor (VIF) shows that there is no serious multicollinearity problem in the regression model. As shown in Table 5.9, Panel B, the highest VIF in this model is (3.75). This suggests that, while multicollinearity, exists, it does not create a serious problem. Again as detailed in Table 5.9, the results of this regression not only provided strong evidence of the significance and direction of the relationships as previously hypothesized; but also established a baseline by which to analyze the incremental value-relevance of EVA.

Here again, to choose between the fixed or random-effects models, the Hausman (1978) specification test was used. As can be seen from Table 5.10, the test statistic works out to 178.86 and the critical value for 5 degrees of freedom is smaller than this; it is

11.07.[57] Thus, the Hausman specification test confirms the superiority of the fixed-effects model over the random-effects model. Moreover, as summarized in Table 5.8, the results of this regression indicate a significant relationship to all of the independent variables and provide a baseline for analyzing the incremental value-relevance of EVA components. To address this incremental value-relevance question, EVA was broken down into three components, that is: Profitability Spread, Total Invested Capital, and Lagged EVA; and the contribution of each component toward explaining contemporaneous MVA was assessed.

Following the value-relevance methodology, this hypothesis was tested using a two step process. First, the value-relevance of each of the five explanatory variables; that is, Profitability Spread, Total Invested Capital, Lagged EVA, TSR, and Tobin's Q was evaluated. To accomplish this, each of these variables was specified as the explanatory variable in separate univariate regressions with MVA as the dependent variable:

$$\ln MVA_{it} = \alpha_0 + \alpha_1 \ln profitability\ spread_{it} + e_{it} \tag{5.14}$$

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln total\ invested\ capital_{it} + e_{it} \tag{5.15}$$

$$\ln MVA_{it} = \gamma_0 + \gamma_1 \ln Lagged\ EVA_{it} + e_{it} \tag{5.16}$$

$$\ln MVA_{it} = \delta_0 + \delta_1 \ln TSR_{it} + e_{it} \tag{5.17}$$

$$\ln MVA_{it} = \pi_0 + \pi_1 \ln Tobin's\ Q_{it} + e_{it} \tag{5.18}$$

[57] Chi-square critical values are from Schmidt (2005), p.405.

Value-relevance was, then, assessed by comparing R-squares of the five regressions. Table 5.11 (Panel A, B, C, D, and E) presents the results and shows that the profitability spread has the greatest value-relevance—that is, it possess the greatest information power in explaining the variation in the MVA. The main observation was that the profitability spread has a significantly higher R-square (38.65%) than that of Tobin's Q (34.80%) and TSR (5.70%). Tobin's Q in return has a significantly higher R-square (34.80%) than Lagged EVA (30.20%) and TIC (14.09%).

In the second step, a set of tests was performed to find out which of the five predictors of shareholder wealth provides value-relevance data beyond that provided by other measures. In these tests, each of the five explanatory variables was paired alternately with each other in a multivariate regression. For example, the incremental value-relevance for the profitability spread over Tobin's Q was obtained from a multivariate regression where both the profitability spread and Tobin's Q were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it} \qquad (5.19)$$

Taking the R-square from this pair-wise regression (Equation 5.19), and subtracting the individual R-square for Tobin's Q obtained in the earlier univariate regression (Equation 5.18), yielded the incremental value-relevance of profitability spread over Tobin's Q. Likewise, the incremental value-relevance for the profitability spread over TSR was obtained from a multivariate regression where both profitability spread and TSR were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(TSR_{it}) + e_{it} \quad (5.20)$$

Taking the R-square from this pair-wise regression (Equation 5.20), and subtracting the individual R-square for TSR obtained in the earlier univariate regression (Equation 5.17), yielded the incremental value-relevance of profitability spread over TSR. Similarly, the incremental value-relevance for profitability spread (PS) over TIC was obtained from a multivariate regression where both PS and TIC were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(TIC_{it}) + e_{it} \quad (5.21)$$

Taking the R-square from this pair-wise regression (Equation 5.21), and subtracting the individual R-square for TIC obtained in the earlier univariate regression (Equation 5.15), yielded the incremental value-relevance of profitability spread over TIC. Also, the incremental value-relevance for profitability spread (PS) over Lagged EVA was obtained from a multivariate regression where both PS and Lagged EVA were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(Lagged\ EVA_{it}) + e_{it} \quad (5.22)$$

Taking the R-square from this pair-wise regression (Equation 5.22), and subtracting the individual R-square for Lagged EVA obtained in the earlier univariate regression (Equation 5.16), yielded the incremental value-relevance of profitability spread over Lagged EVA. Similarly, the incremental value-relevance for TIC over Tobin's Q was obtained from a multivariate regression where both TIC and Tobin's Q were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(total\ invested\ capital_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it} \qquad (5.23)$$

Taking the R-square from this pair-wise regression (Equation 5.23), and subtracting the individual R-square for Tobin's Q obtained in the earlier univariate regression (Equation 5.18), yielded the incremental value-relevance of TIC over Tobin's Q. Also, the incremental value-relevance for TIC over TSR was obtained from a multivariate regression where both TIC and TSR were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(total\ invested\ capital_{it}) + \beta_2 \ln(TSR_{it}) + e_{it} \qquad (5.24)$$

Taking the R-square from this pair-wise regression (Equation 5.24), and subtracting the individual R-square for TSR obtained in the earlier univariate regression (Equation 5.17), yielded the incremental value-relevance of TIC over TSR. Similarly, the incremental value-relevance for Lagged EVA over Tobin's Q was obtained from a multivariate

regression where both Lagged EVA and Tobin's Q were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(Lagged\ EVA_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it} \qquad (5.25)$$

Taking the R-square from this pair-wise regression (Equation 5.25), and subtracting the individual R-square for Tobin's Q obtained in the earlier univariate regression (Equation 5.18), yielded the incremental value-relevance of Lagged EVA over Tobin's Q. Similarly, the incremental value-relevance for Lagged EVA over TSR was obtained from a multivariate regression where both Lagged EVA and TSR were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(Lagged\ EVA_{it}) + \beta_2 \ln(TSR_{it}) + e_{it} \qquad (5.26)$$

Taking the R-square from this pair-wise regression (Equation 5.26), and subtracting the individual R-square for TSR obtained in the earlier univariate regression (Equation 5.17), yielded the incremental value-relevance of Lagged EVA over TSR.

Finally, the incremental value-relevance for TIC over Lagged EVA was obtained from a multivariate regression where both TIC and Lagged EVA were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(total\ invested\ capiral_{it}) + \beta_2 \ln(Lagged\ EVA_{it}) + e_{it} \qquad (5.27)$$

Taking the R-square from this pair-wise regression (Equation 5.27), and subtracting the individual R-square for Lagged EVA obtained in the earlier univariate regression (Equation 5.17), yielded the incremental value-relevance of TIC over Lagged EVA. Also, the incremental value-relevance for TSR over Tobin's Q was obtained from a multivariate regression where both TSR and Tobin's Q were specified as explanatory variables:

$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(TSR_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it} \qquad (5.28)$$

Taking the R-square from this pair-wise regression (Equation 5.28), and subtracting the individual R-square for Tobin's Q obtained in the earlier univariate regression (Equation 5.18), yielded the incremental value-relevance of TSR over Tobin's Q.

Table 5.12 (Panel A, B, C, D, E, F, G, H, I, and J) displays the results of the pair-wise regressions of the EVA components. As summarized in Table 5.13 Panel A and B, the profitability spread (PS), one of the primary drivers of EVA, is indeed the most significant explanatory metric by itself (38.65%) or when paired with Tobin's Q (43.11%). The pair-wise combinations that most explain MVA, in order of decreasing explanatory power, are PS/Tobin's Q (43.11%), Lagged EVA/Tobin's Q (42.77%), PS/Lagged EVA (40.30%), PS/TIC (40.29%), PS/TSR (37.94%), TIC/Tobin's Q (37.84%), TSR/Tobin's Q (35.66%), Lagged EVA/TSR (31.56%), TIC/Lagged EVA (28.44%),and TIC/TSR (15.95%). Here again the comparison of regressions provides further evidence of the

relative value-relevance of EVA over TSR and Tobin's Q in explaining shareholder wealth as hypothesised.

Furthermore, Table 5.14 presents the incremental value-relevance results. In fact, it provides the hypothesis tests of Equation (5.13) that profitability spread (PS), total invested capital (TIC), lagged EVA (Lagged EVA), TSR, and Tobin's Q have equal incremental value-relevance, that is, equal explanatory power. Taking the R-square from each pair-wise regression in Table 5.13 Panel B, and subtracting the R-square obtained in the earlier univariate regression (Table 5.11) yielded the tests for incremental value–relevance. For example, in Table 5.14 ProfitabilitySpread / TSR (32.24%) is equal to the relative value-relevance of the pair-wise comparison of ProfitabilitySpread and TSR (37.94%) from Table 5.13 Panel B minus the individual value-relevance of TSR (5.70%) from Table 5.13 Panel A. Thus, the explanatory power has increased by 32.24% due to the ProfitabilitySpread measure. Finally as hypothesised, value-relevance tests once again reveal MVA to be more closely associated to EVA and its components than TSR or Tobin's Q.

5.4 Concluding Remarks

Chapter 5 combines the research findings and analysis and presents a detailed critical discussion of these results by comparing them with the main ones discussed in the literature review. Using a sample of panel data of 12,000 firm-year observations taken from the Stern Stewart 1000 EVA/MVA database and the datastream files over the period 1991–2002, this study has found compelling evidence that shareholder value is a function of

EVA. It also substantiates other evidence that EVA outperforms other traditional performance measures in explaining the cumulative change in shareholder wealth. Value-relevance tests reveal EVA to be more highly associated with shareholder wealth than TSR and Tobin's Q. Incremental tests have also suggested that EVA possesses the largest explanatory power (or information usefulness) over TSR and Tobin's Q. All these results conclusively support the claims made by EVA proponents of EVA's usefulness as an internal and external corporate performance measurement.

CHAPTER 6

CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This chapter summarizes the major findings of this thesis, discusses its contributions, and identifies research limitations, as well; it offers some thoughts about opportunities for future research.

Over the last two decades, a dramatic change has occurred in the way corporations are run or operate. Globalization, technological changes, ownership concentration, accountability, the information revolution including the internet, as well as the ever increasing sophistication of the financial markets have become the primary forces behind the transformation of corporations and the climate in which they operate. Companies around the globe are under great pressure not only to adapt to this new climate, but also to perform consistently well in all markets in which they compete – namely, the product market, the labour market, and the capital market. If they do not adapt on all levels; they will be forced to go bankrupt or will have face the threat of being taken over.

All the above mentioned, but in particular, the increase in ownership concentration of common shares in the hands of institutional investors have set the stage for increased pressure on corporate management to refocus their efforts toward shareholder concerns. Today, academics, business professionals, and stock market analysts widely agree that maximizing shareholder wealth is the most vital financial objective of a business

enterprise. However, widely divergent opinions exist as to how this value can be identified, measured, and ultimately, optimized.

For awhile now, the traditional accounting measures of corporate performance such as ROA, ROE, and EPS are meeting up with ever increasing criticism and dissatisfaction. Opponents argue that these measures provide a relatively poor guide to shareholder value. Rappopart's pioneering work (1986, 1998) that focused on shareholder value took into account the shortcomings of the traditional accounting measures, thus preparing the way for a value-based management (VBM) approach. This new approach has gained widespread approval as it outlines two important propositions: first, that shareholder value creation is the primary corporate objective, and secondly, that economic income of a company, as expressed by its EVA, is the primary measure of corporate performance (Davies, 2000, p. 38).

Shareholder value has thus long been the theme of the financial economist. Studies show that companies thrive when real economic value is created for their shareholders (e.g., McKinsey et al., 2005; Copeland et al., 1996; Rappopart, 1994, 1998; McTaggert et al., 1994). Yet, this can only happen if corporations are capable of making strategic and operating decisions that will yield a return in excess of their cost of capital. If they are capable of carrying this out; of course, there is an added benefit to society. Therefore, value creation should be part of any company's culture. These fundamental principles concerning value creation have been around for a long time, and the events of the recent past have only strengthened our conviction in them. When managers, boards of directors, and investors forget these simple truths, the consequences can be detrimental to the overall

operation of the company and society, in general. Let's look back over the last 30 or so years. Consider the 1970s, with the rise and fall of big business conglomerates; the 80s with the hostile takeovers in the United States; the 90's with the collapse of Japan's bubble economy and the Southeast Asian crisis; the Internet bubble breaking; as well as the corporate governance scandals; and last, but not least, consider the ongoing mortgage crisis.

Performance measurement, like many other subfields in corporate finance and management accounting, has had numerous controversies and debates on issues surrounding its theory, its methodologies, as well as the implementation of its findings. The issue of whether Economic Value Added (EVA), a variant of residual income, is highly correlated with the market value of the firm as its proponents claim has been mired in ongoing theoretical and methodological controversy. The primary motivation for this study stemmed from the desire to provide empirical evidence for the value-relevance of EVA vis-à-vis other value-based performance metrics in predicting shareholder wealth. The secondary motivation was due to the recent interest in the theory and application of value-based metrics shown by academics, consulting firms, money managers, business analysts, and corporate executives evidenced in the context of the ever growing prominent finance and accounting conferences, publications, and other professional meetings.

The study draws upon extensive prior research to develop three interrelated research hypotheses. First, I hypothesize that EVA is positively and significantly related to

Market Value Added (MVA).[58] Second, I hypothesize that EVA is more highly associated with MVA than other commonly-used value-based performance measures such as TSR and Tobin's Q. Third, I hypothesize that components unique to EVA help in explaining contemporaneous MVA beyond that explained by TSR and Tobin's Q.

Contrary to what other studies (e.g., Biddle et al. 1997; Chen & Dodd 1997) concluded, the findings of this study show that EVA dominates value-based performance metrics such as TSR and Tobin's Q in its association with shareholder wealth. In this study, EVA, TSR, and Tobin's Q were treated as competing value-based performance measures and a multivariate regression model was run using a sample of panel data of 12,000 firm-year observations covering the period 1991-2002 obtained from Stern Stewart and DATASTREAM as described in the preceding chapters. The value-relevance tests revealed that shareholder value (or MVA) is indeed more closely associated with EVA than TSR and Tobin's Q. The analysis of these regressions indicates that the relationship between EVA and MVA is significant and that EVA exhibits the largest explanatory power among the measures. In fact, EVA was significant alone in the univariate regressions and was incrementally value-relevant in combination with TSR or Tobin's Q in the multivariate regressions. These results, therefore, persuasively support the claims made by EVA advocates that it outperforms other performance measures in explaining shareholder wealth.

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[58] As previously stated, Market value Added (or MVA) represents the value created over the lifetime of the firm and can be seen as a proxy for the past and current value of the strategies of the firm.

Overall, the findings in this study are broadly comparable to prior studies supporting the information usefulness of EVA, including O'Byrne (1996), Bao & Bao (1998), Worthington & West (2004), Zafiris and Bayldon (1999), Lehn and Makhija (1997), Grant (2003), and Feltham et al. (2004), among others. However, the disparity between the findings of this study and that of others requires explanation. It is thought likely that this can be attributed to two major possibilities:

- differences in research design and methodology; and
- differences in the accounting principles and variables definition.

This study extends prior studies on the relationship between value-based performance metrics and shareholder value creation. The objective of this study was to empirically examine the hypothesis that EVA is highly associated with MVA. The purpose of the study, though, was not to fully explain the determinants of MVA, but only to show how well EVA acts as a genuine explanatory variable for MVA, in order to justify its appropriateness for performance measurement, CEO compensation, financial reporting, and shareholder value creation. Two more commonly used value-based performance metrics—that is, Total Shareholder Return (TSR) and Tobin's Q were also considered to highlight the value-relevance of EVA vis-à-vis these measures in predicting shareholder wealth.

This study will contribute to the growing literature on performance measurement as it made use of pooled time-series cross-sectional data, which certainly allows for greater empirical certainty on the usefulness of EVA. Moreover, the current study is the first study of which I am aware to use data on four value-based performance metrics—namely, EVA,

MVA, TSR and Tobin's Q and covers a more recent period in the context of corporate performance and shareholder value creation. Thus, this study provides evidence that would prove useful to policy makers who are interested in EVA as a replacement or a complement to traditional accounting-based performance metrics for their decision-making and compensation purposes.

However, this study is not without some limitations. Initially, it was intended that it would consist of all the five prominent value-based metrics—that is, CFROI, SVA, TSR, Tobin's Q, and EVA. But due to a lack of data, the first two metrics were dropped from the study, limiting it to just three performance metrics. Also, it was not the goal of this study to explore how firms achieved their levels of EVA or to detail how firms should go about increasing their EVA level to deliver higher levels of market value added. Such research would be dramatically essential, but is beyond the scope of the measures publicly available at this time. The results presented in this thesis have, though, provided some necessary insight into the value-relevance of EVA vis-à-vis commonly-used value-based performance measures. However, several other issues would have to be considered further in order to develop a more complete understanding of what factors drive shareholder value. Rather than replicating current studies with slightly different settings, future research should be expanded to include more financial and non-financial metrics such as customer loyalty, R&D, employee satisfaction, IT, and productivity measures, to mention only a few.

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APPENDICES

Appendix A: Figures

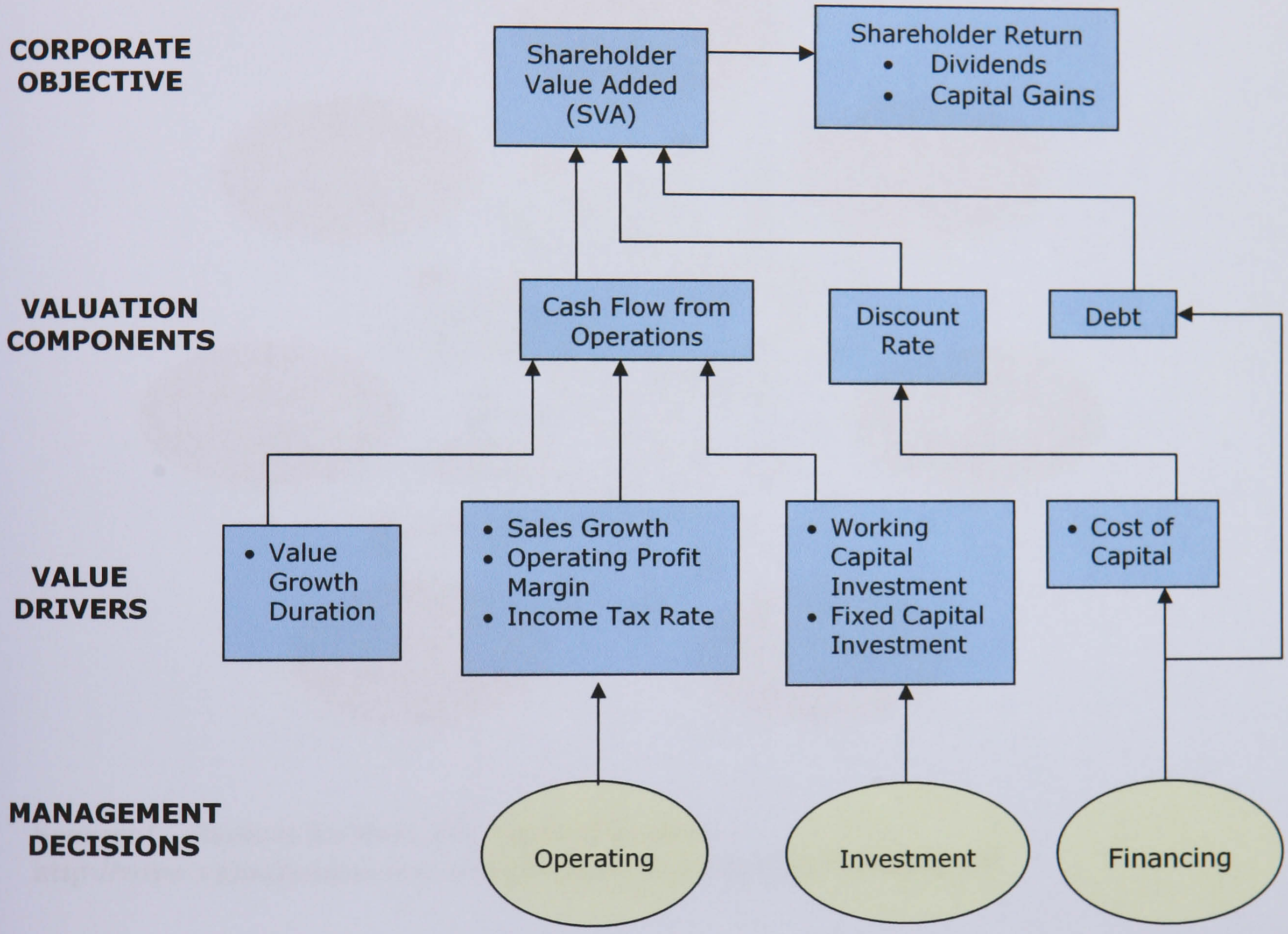
Appendix B: Tables

Appendix C: The 2002 Stern Stewart Performance 1000

Appendix A

FIGURE 1

THE SHAREHOLDER VALUE ANALYSIS NETWORK



Source: Rappaport (1998), p. 56.

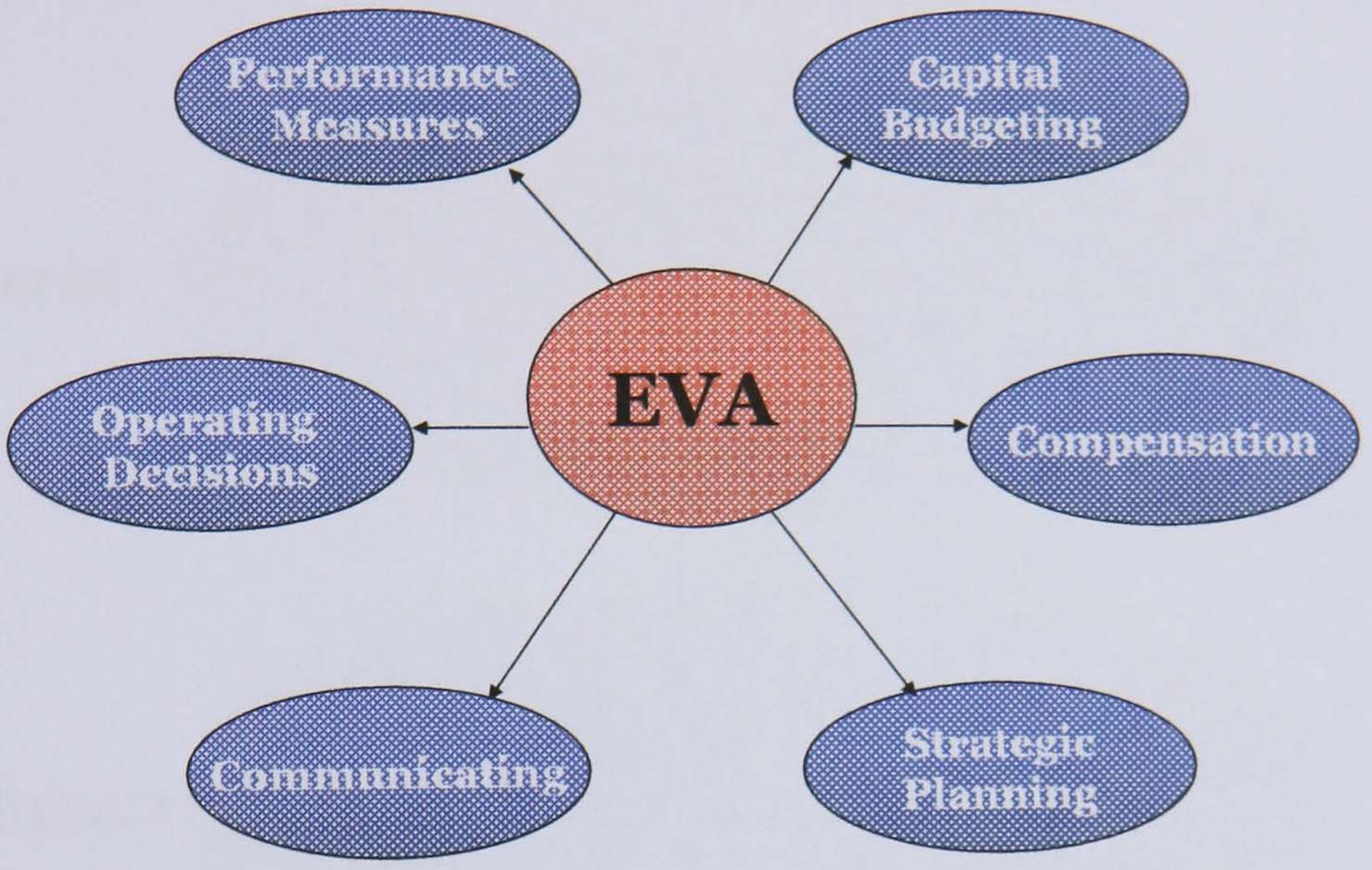
FIGURE 2

A TYPICAL FINANCIAL MANAGEMENT SYSTEM (FUZZY FINANCE)

Source: G. Bennett Stewart, III, Focused Finance.
http://www.valuationissues.com/valiss/servlet/viewarticle?articleID=95

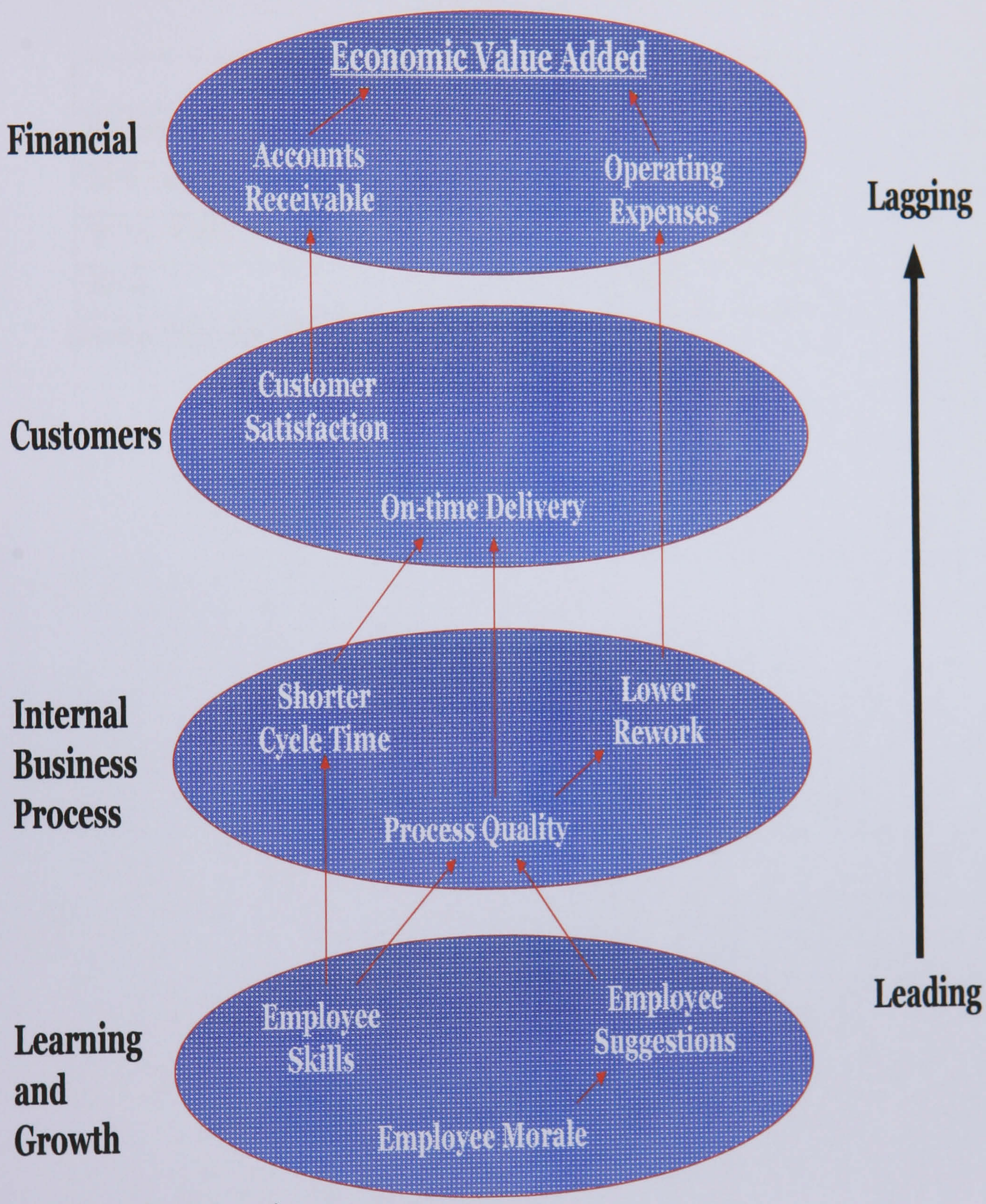
FIGURE 3

EVA: A Simplified and Focused Financial Management System



Source: Adopted from Morin and Jarrell, p.46

FIGURE 4
Balanced Scorecard: Outcome Measures & Performance Drivers



Source: Fletcher & Smith (2004), p.5

Appendix B:

TABLE 2.1

HOW PERFORMANCE MEASURES "EXPLAIN" CHANGES IN MVA

Variable/Model	R^2
Growth in Sales	10%
EPS and NI	15%-20%
ROA, ROE, RONA	about 35%
EVA	50%

Source: Stewart (1994), p.75.

TABLE 4.1

CALCULATION OF NOPAT FROM FINANCIAL DATA

A. Bottom-up approach
Begin:
Operating profit after depreciation and amortization
Add:
Implied interest expense on operating leases
Increase in LIFO reserve
Increase in accumulated goodwill amortization
Increase in bad-debt reserve
Increase in capitalized research and development
Increase in cumulative write-offs of special items
Equals:
Adjusted operating profit before taxes
Subtract:
Cash operating taxes
Equals:
NOPAT
B. Top-down approach
Begin:
Sales
Subtract:
Cost of goods sold
Selling, general, and administrative expenses
Depreciation
Add:
Implied interest expense on operating leases
Increase in LIFO reserve
Other operating income
Equals:
Adjusted operating profit before taxes
Subtract:
Cash operating taxes
Equals:
NOPAT

Note: Table based on information in G. Bennett Stewart III, The Quest for Value (New York: Harper Collins, 1991).

TABLE 4.2

CALCULATION OF CAPITAL USING ACCOUNTING FINANCIAL STATEMENTS

A. Asset approach
Begin:
Net (short term) operating assets
Add:
LIFO reserve
Net plant and equipment
Other assets
Goodwill (Intangibles)
Accumulated goodwill amortization
Present value of operating leases
Bad-debt reserve
Capitalized research and development
Cumulative write-offs of special items
Equals:
Capital
B. Source of financing approach
Begin:
Book value of common equity
Add equity equivalents:
Preferred stock
Minority interest
Deferred income tax reserve
LIFO reserve
Accumulated goodwill amortization
Add debt and debt equivalents:
Interest-bearing short-term debt
Long-term debt
Capitalized lease obligations
Present value of noncapitalized leases
Equals:
Capital

Note: Table based on information in G. Bennett Stewart III, The Quest for Value (New York: Harper Collins, 1991).

TABLE 5.1
DESCRIPTIVE STATISTICS OF VARIABLES EMPLOYED IN THE REGRESSION MODELS

Variable		Mean	Std. Dev.	Min	Max	Observations	
MVA	overall	5266.249	20431.39	-72667	505162	N =	9532
	between		14906.85	-9778.25	188466.5	n =	1000
	within		13329.41	-167248.8	423189.8	T-bar =	9.532
EVA	overall	-81.15118	952.4533	-29732	8358	N =	9578
	between		665.9038	-7602	4312	n =	1000
	within		687.4061	-24906.6	9583.849	T-bar =	9.578
NOPAT	overall	401.9223	1116.824	-24849	18723	N =	9889
	between		1014.2	-3121.9	13073.25	n =	1000
	within		589.4312	-21325.18	9938.506	T-bar =	9.889
TSR	overall	.2588763	.8658269	-.938144	44.46667	N =	8954
	between		.3386405	-.606695	3.850578	n =	914
	within		.8177131	-4.37565	40.87497	T-bar =	9.7965
TobinQ	overall	8.405437	525.884	-6108.15	49898.73	N =	9497
	between		284.1693	-500.13	8626.205	n =	936
	within		477.7714	-8664.77	41280.93	T-bar =	10.1464
SPREAD	overall	.0015204	.3194024	-7.86567	21.57341	N =	9578
	between		.166963	-.63312	4.149515	n =	1000
	within		.2690804	-10.05144	17.42542	T-bar =	9.578
TIC	overall	5796.468	13470.59	-1395	233490	N =	10016
	between		11586.65	-534.9167	116989	n =	1000
	within		6526.184	-51475.03	172904.1	T-bar =	10.016
ROIC	overall	.0933339	.3195998	-7.78067	21.67341	N =	9578
	between		.1663764	-.49786	4.227182	n =	1000
	within		.2695485	-9.956298	17.53956	T-bar =	9.578
WACC	overall	.0921327	.0241721	.042	.188	N =	9845
	between		.0216499	.05125	.173	n =	1000
	within		.0092914	.0383593	.129466	T-bar =	9.845
lagEVA	overall	-81.13532	952.5018	-29732	8358	N =	9577
	between		588.7881	-7758.75	3805	n =	1000
	within		741.8563	-25692.14	9199.948	T-bar =	9.577

Variable Definitions:

MVA=Market Value Added; EVA=Economic Value Added; TSR=Total Shareholder Return; TobinQ=Tobin's Q; SPREAD=Profitability or EVA Spread; TIC=Total Invested Capital; ROIC=Return on Invested Capital; WACC=Weighted Average Cost of Capital; lagEVA=Lagged Economic Value Added

TABLE 5.2
CORRELATION BETWEEN VARIABLES
This table reports Pearson correlation coefficient between all variables used in the analysis

	MVA	EVA	TSR	TobinQ	SPREAD	TIC	lagEVA
MVA							
EVA	0.6102						
TSR	0.0346	-0.0028					
TobinQ	0.1210	0.0488	0.0197				
SPREAD	0.1683	0.1351	0.0326	0.0194			
TIC	0.5541	0.8840	0.0572	0.0622	0.0731		
lagEVA	0.0345	0.0148	0.0090	0.0002	0.1550	0.0004	

These correlations are estimated using 9532 observations.

See Table 5.1 for all variable definitions.

TABLE 5.3
HYPOTHESIS (1)
UNIVARIATE REGRESSION RESULTS
Panel A

Model: $sMVA_{it} = \beta_0 + \beta_1 sEVA_{it} + e_{it}$

Statistic	
Number of Observations	9449
Dependent Variable	sMVA
Independent Variable	sEVA
R-Squared	0.3724
Coefficients:	
Constant	3.364659
Std. error	0.4932272
95% C.I.	2.397813/4.331505
Independent Variable (sEVA)	10.32568
Std. error	0.1370467
95% C.I.	10.05704/10.59433
t-statistics:	
Constant	6.82
Independent Variable (sEVA)	75.34
Independent Variable	
p-value:	
Constant	0.000
Independent Variable (sEVA)	0.000

TABLE 5.3 (continued)
HYPOTHESIS (1)
UNIVARIATE REGRESSION RESULTS
Panel B

Model: $\boxed{sMVA_{it} = \beta_0 + \beta_1 sNOPAT_{it} + e_{it}}$

Statistic	
Number of Observations	9473
Dependent Variable	sMVA
Independent Variable	sNOPAT
R-Squared	0.3748
Coefficients:	
Constant	2.297306
Std. error	0.4917629
95% C.I.	1.33333/3.261281
Independent Variable (sNOPAT)	9.986957
Std. error	0.1320177
95% C.I.	9.72817/10.24574
t-statistics:	
Constant	4.67
Independent Variable (sNOPAT)	75.65
p-value:	
Constant	0.000
Independent Variable (sNOPAT)	0.000

TABLE 5.4
HYPOTHESIS (2)
MULTIVARIATE REGRESSION RESULTS
Panel A

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(EVA_{it}) + \beta_2 \ln(TSR_{it}) + \beta_3 \ln(Tobin's\ Q_{it}) + e_{it}$

Statistic	
Number of Observations	2606
Dependent Variable	lnMVA
Independent Variable	lnEVA, lnTSR, lnTobin'sQ
R-Squared	0.3028
Coefficients:	
Constant	2.945609
Std. error	0.1001646
95% C.I.	2.749169/3.142049
Independent Variable (lnEVA)	0.241497
Std. error	0.143445
95% C.I.	0.2129177/0.2691817
Independent Variable (lnTSR)	0.0762908
Std. error	0.0105902
95% C.I.	0.0555216/0.09706
Independent Variable (lnTobin'sQ)	0.2897801
Std. error	0.0177318
95% C.I.	0.255005/0.3245551
t-statistics:	
Constant	29.41
Independent Variable (lnEVA)	16.80
Independent Variable (lnTSR)	7.20
Independent Variable (lnTobin'sQ)	16.34
p-value:	
Constant	0.000
Independent Variable (lnEVA)	0.000
Independent Variable (lnTSR)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.4 (continued)

HYPOTHESIS (2)
MULTIVARIATE REGRESSION RESULTS

Panel B
COLLINEARITY DIAGNOSTICS

Variable	VIF	Tolerance	R-Squared
lnEVA	1.24	0.8034	0.1966
lnTSR	1.06	0.9392	0.0608
lnTobin'sQ	1.28	0.7841	0.2159

Mean VIF: 1.19
Condition Number: 9.1878

TABLE 5.5
FIXED vs. RANDOM EFFECTS
(HAUSMAN TEST)
(Equation 5.3)

Model: $$MVA_{it} = \beta_0 + \beta_1(\ln EVA_{it}) + \beta_2(\ln TSR_{it}) + \beta_3(\ln Tobin's\ Q_{it}) + e_{it}$$

Fixed Effects:

Statistic	
Number of Observations	2606
Dependent Variable	lnMVA
Independent Variable	lnEVA, lnTSR, lnTobin'sQ
R-Squared	0.3028
Coefficients:	
Constant	2.945609
Std. error	0.1001646
95% C.I.	2.749169/3.142049
Independent Variable (lnEVA)	0.241497
Std. error	0.143445
95% C.I.	0.2129177/0.2691817
Independent Variable (lnTSR)	0.0762908
Std. error	0.0105902
95% C.I.	0.0555216/0.09706
Independent Variable (lnTobin'sQ)	0.2897801
Std. error	0.0177318
95% C.I.	0.255005/0.3245551
t-statistics:	
Constant	29.41
Independent Variable (lnEVA)	16.80
Independent Variable (lnTSR)	7.20
Independent Variable (lnTobin'sQ)	16.34
p-value:	
Constant	0.000
Independent Variable (lnEVA)	0.000
Independent Variable (lnTSR)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.5 (continued)

Random Effects:

Statistic	
Number of Observations	2606
Dependent Variable	lnMVA
Independent Variable	lnEVA, lnTSR, lnTobin'sQ
R-Squared	0.5401
Coefficients:	
Constant	3.165228
Std. error	0.084107
95% C.I.	3.000381/3.330075
Independent Variable (lnEVA)	0.2760608
Std. error	0.0131028
95% C.I.	0.2503798/0.3017417
Independent Variable (lnTSR)	0.0767928
Std. error	0.0103314
95% C.I.	0.0565435/0.097042
Independent Variable (lnTobin'sQ)	0.3218157
Std. error	0.0136327
95% C.I.	0.2950961/0.3485352
z-statistics:	
Constant	37.63
Independent Variable (lnEVA)	21.07
Independent Variable (lnTSR)	7.43
Independent Variable (lnTobin'sQ)	23.61
p-value:	
Constant	0.000
Independent Variable (lnEVA)	0.000
Independent Variable (lnTSR)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.5 (continued)

Coefficients:				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	eqFIX	.	Difference	S.E.
lnsEVA	.2410497	.2760608	-.0350111	.005838
lnTSR	.0762908	.0767928	-.000502	.0023268
lnsTobin'sQ	.2897801	.3218157	-.0320356	.0113387

b = consistent under Ho and Ha
B = inconsistent under Ha, efficient under Ho

Test: Ho: difference in coefficients not systematic

chi2 (3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 57.04
Prob>chi2 = 0.0000

TABLE 5.6
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (2) TESTING
Panel A

Model: $\ln MVA_{it} = \alpha_0 + \alpha_1 \ln EVA_{it} + e_{it}$

Statistic	
Number of Observations	4383
Dependent Variable	lnMVA
Independent Variable	lnEVA
R-Squared	0.3912
Coefficients:	
Constant	1.410927
Std. error	0.0413741
95% C.I.	1.329807/1.492046
Independent Variable (lnEVA)	0.332561
Std. error	0.0117604
95% C.I.	0.3095033/0.3556188
t-statistics:	
Constant	34.10
Independent Variable (lnEVA)	28.28
p-value:	
Constant	0.000
Independent Variable (lnEVA)	0.000

TABLE 5.6 (continued)
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (2) TESTING
Panel B

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln Tobin's\ Q_{it} + u_{it}$

Statistic	
Number of Observations	6715
Dependent Variable	lnMVA
Independent Variable	lnTobin's Q
R-Squared	0.3480
Coefficients:	
Constant	2.835
Std. error	0.0753512
95% C.I.	2.687584/2.983016
Independent Variable (lnTobin'Q)	0.4931501
Std. error	0.0124448
95% C.I.	0.4687538/0.5175465
t-statistics:	
Constant	37.63
Independent Variable (lnTobin'sQ)	39.63
p-value:	
Constant	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.6 (continued)
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (2) TESTING
Panel C

Model: $\ln MVA_{it} = \gamma_0 + \gamma_1 \ln TSR_{it} + v_{it}$

Statistic	
Number of Observations	4966
Dependent Variable	lnMVA
Independent Variable	lnTSR
R-Squared	0.0570
Coefficients:	
Constant	0.1249479
Std. error	0.0193188
95% C.I.	0.0870726/0.1628232
Independent Variable (lnTSR)	0.1202252
Std. error	0.0114126
95% C.I.	0.0978502
t-statistics:	
Constant	6.47
Independent Variable (lnTSR)	10.53
p-value:	
Constant	0.000
Independent Variable (lnTSR)	0.000

TABLE 5.7
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (2) TESTING
Panel A

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(EVA_{it}) + \beta_2 \ln(TSR_{it}) + e_{it}$

Statistic	
Number of Observations	2877
Dependent Variable	lnMVA
Independent Variable	lnEVA, lnTSR
R-Squared	0.4211
Coefficients:	
Constant	1.528633
Std. error	0.0503877
95% C.I.	1.42982/1.627445
Independent Variable (lnEVA)	0.3165868
Std. error	0.0141168
95% C.I.	0.288903/0.3442705
Independent Variable (lnTSR)	0.0899577
Std. error	0.0106514
95% C.I.	0.0690698/0.1108457
t-statistics:	
Constant	30.34
Independent Variable (lnEVA)	22.43
Independent Variable (lnTSR)	8.45
p-value:	
Constant	0.000
Independent Variable (lnEVA)	0.000
Independent Variable (lnTSR)	0.000

TABLE 5.7 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (2) TESTING
Panel B

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(EVA_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it}$

Statistic	
Number of Observations	3648
Dependent Variable	lnMVA
Independent Variable	lnEVA, lnTobin'sQ
R-Squared	0.5293
Coefficients:	
Constant	2.909641
Std. error	0.0836618
95% C.I.	2.7456/3.073683
Independent Variable (lnEVA)	0.2405591
Std. error	0.0124102
95% C.I.	0.2162255/0.2648927
Independent Variable (lnTobin'sQ)	0.3223923
Std. error	0.0124102
95% C.I.	0.2162255/0.2648927
t-statistics:	
Constant	34.78
Independent Variable (lnEVA)	19.38
Independent Variable (lnTobin'sQ)	20.85
p-value:	
Constant	0.000
Independent Variable (lnEVA)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.7 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (2) TESTING
Panel C

Model: $\ln MVA_{it} = \beta_0 + \ln \beta_1 (Tobin's\ Q_{it}) + \beta_2 \ln(TSR_{it}) + e_{it}$

Statistic	
Number of Observations	4410
Dependent Variable	lnMVA
Independent Variable	lnTobin'sQ, lnTSR
R-Squared	0.3566
Coefficients:	
Constant	2.835656
Std. error	0.0968174
95% C.I.	2.645834/3.025478
Independent Variable (lnTobn'sQ)	0.4528348
Std. error	0.0160809
95% C.I.	0.4213063/0.4843633
Independent Variable (lnTSR)	0.0940835
Std. error	0.0110063
95% C.I.	0.0725042/0.1156627
t-statistics:	
Constant	29.29
Independent Variable (lnTobin'sQ)	28.16
Independent Variable (lnTSR)	8.55
p-value:	
Constant	0.000
Independent Variable (lnTobin'sQ)	0.000
Independent Variable (lnTSR)	0.000

TABLE 5.8

HYPOTHESIS (2)

RELATIVE AND INCREMENTAL VALUE-RELEVANCE TESTS

Panel A
Relative Value-Relevance Test
(individual)

	EVA		Tobin's Q		TSR
R^2	39.12%	>	34.80%	>	5.70%

Panel B
Relative Value-Relevance Test
(pair-wise combinations)

	EVA/Tobin's Q		EVA/TSR		Tobin's Q /TSR
R^2	52.93%	>	42.11%	>	35.66%

Panel C
Incremental Value-Relevance Test

	EVA/TSR		EVA/Tobin's Q
R^2	36.41%	>	18.13%

TABLE 5.9
HYPOTHESIS (3)
MULTIVARIATE REGRESSION RESULTS
Panel A

Model: $$\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(total\ invested\ capital_{it}) + \beta_3 \ln(Lagged\ EVA_{it}) + \beta_4 \ln(TSR_{it}) + \beta_5 \ln(Tobin's\ Q_{it}) + e_{it}$$

Statistic	
Number of Observations	1979
Dependent Variable	lnMVA
Independent Variable	lnSPREAD, LnTIC, lnLagEVA, lnTSR, lnTobinsQ
R-Squared	0.4724
Coefficients:	
Constant	3.491256
Std. error	0.1616931
95% C.I.	3.174074/3.808437
Independent Variable (lnSPREAD)	0.129359
Std. error	0.01586
95% C.I.	0.0982846/0.1605073
Independent Variable (lnTIC)	0.3064579
Std. error	0.0482726
95% C.I.	0.2117649/0.4011508
Independent Variable (lnLagEVA)	0.04811
Std. error	0.0178984
95% C.I.	0.0130001/0.08322
Independent Variable (lnTSR)	0.0841718
Std. error	0.0121273
95% C.I.	0.0603826/0.107961

Independent Variable (Tobin'sQ)	0.2506594
Std. error	0.0251512
95% C.I.	0.2013222/0.2999966
t-statistic	
Constant	21.59
Independent Variable (lnSPREAD)	8.16
Independent Variable (lnTIC)	6.35
Independent Variable (lnLagEVA)	2.69
Independent Variable (lnTSR)	6.94
Independent Variable (lnTobin'sQ)	9.97
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000
Independent Variable (lnTIC)	0.000
Independent Variable (lnLagEVA)	0.007
Independent Variable (lnTSR)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.9 (continued)

HYPOTHESIS (3)
MULTIVARIATE REGRESSION RESULTS
Panel B
Collinearity Diagnostics

Variable	VIF	Tolerance	R-Squared
(lnSPREAD)	3.75	0.2666	0.7334
(lnTIC)	1.13	0.8867	0.1133
(lnLagEVA)	1.63	0.6134	0.3866
(lnTSR)	1.07	0.9380	0.0620
(lnTobin'sQ)	2.94	0.3406	0.6594

Mean VIF: 2.10
Condition Number: 25.3668

TABLE 5.10
FIXED vs. RANDOM EFFECTS (Equation 5.13):
Hausman Test

Model:
$$\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(total\ invested\ capital_{it}) + \beta_3 \ln(Lagged\ EVA_{it}) + \beta_4 \ln(TSR_{it}) + \beta_5 \ln(Tobin's\ Q_{it}) + e_{it}$$

Fixed-Effects:

Statistic	
Number of Observations	1979
Dependent Variable	lnMVA
Independent Variable	lnSPREAD, LnTIC, lnLagEVA, lnTSR, lnTobinsQ
R-Squared	0.4724
Coefficients:	
Constant	3.491256
Std. error	0.1616931
95% C.I.	3.174074/3.808437
Independent Variable (lnSPREAD)	0.129359
Std. error	0.01586
95% C.I.	0.0982846/0.1605073
Independent Variable (lnTIC)	0.3064579
Std. error	0.0482726
95% C.I.	0.2117649/0.4011508
Independent Variable (lnLagEVA)	0.04811
Std. error	0.0178984
95% C.I.	0.0130001/0.08322
Independent Variable (lnTSR)	0.0841718
Std. error	0.0121273
95% C.I.	0.0603826/0.107961

Independent Variable (Tobin'sQ)	0.2506594
Std. error	0.0251512
95% C.I.	0.2013222/0.2999966
t-statistic	
Constant	21.59
Independent Variable (lnSPREAD)	8.16
Independent Variable (lnTIC)	6.35
Independent Variable (lnLagEVA)	2.69
Independent Variable (lnTSR)	6.94
Independent Variable (lnTobin'sQ)	9.97
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000
Independent Variable (lnTIC)	0.000
Independent Variable (lnLagEVA)	0.007
Independent Variable (lnTSR)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.10 (continued)

Random Effects:

Statistic	
Number of Observations	1979
Dependent Variable	lnMVA
Independent Variable	lnSPREAD, LnTIC, lnLagEVA, lnTSR, lnTobinsQ
R-Squared	0.4951
Coefficients:	
Constant	3.639706
Std. error	0.1314526
95% C.I.	3.382063/3.897348
Independent Variable (lnSPREAD)	0.1187431
Std. error	0.0147294
95% C.I.	0.089874/0.1476122
Independent Variable (lnTIC)	0.307166
Std. error	0.0472233
95% C.I.	0.2146101/0.3997219
Independent Variable (lnLagEVA)	0.1137458
Std. error	0.0164276
95% C.I.	0.0815484/0.1459432
Independent Variable (lnTSR)	0.0839836
Std. error	0.0118733
95% C.I.	0.0607124/0.1072548
Independent Variable (Tobin'sQ)	0.2802379
Std. error	0.0201392
95% C.I.	0.2407659/3.897348
z-statistic	
Constant	27.69

Independent Variable (lnSPREAD)	8.06
Independent Variable (lnTIC)	6.50
Independent Variable (lnLagEVA)	6.92
Independent Variable (lnTSR)	7.07
Independent Variable (lnTobin'sQ)	13.92
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000
Independent Variable (lnTIC)	0.000
Independent Variable (lnLagEVA)	0.000
Independent Variable (lnTSR)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.10 (continued)

Coefficients				
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	eqFIX	.	Difference	S.E.
lnSPREAD	.1293959	.1187431	.0106529	.0058808
lnTIC	.3064579	.307166	-.0007082	.0100107
lnlagEVA	.04811	.1137458	-.0656358	.0071054
lnTSR	.0841718	.0839836	.0001882	.002469
lnTobinQ	.2506594	.2802379	-.0295785	.0150663

b = consistent under Ho and Ha
B = inconsistent under Ha, efficient under Ho

Test: Ho: difference in coefficients not systematic

chi2 (5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 178.86
Prob>chi2 = 0.0000

TABLE 5.11
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (3) TESTING
Panel A

Model: $\ln MVA_{it} = \alpha_0 + \alpha_1 \ln profitability\ spread_{it} + e_{it}$

Statistic	
Number of Observations	4431
Dependent Variable	lnMVA
Independent Variable	lnSPREAD
R-Squared	0.3103
Coefficients:	
Constant	2.867663
Std. error	0.0905222
95% C.I.	2.690183/3.045142
Independent Variable (lnSPREAD)	0.239306
Std. error	0.0082856
95% C.I.	0.2230611/0.2555509
t-statistics:	
Constant	31.68
Independent Variable (lnSPREAD)	28.88
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000

TABLE 5.11 (continued)
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (3) TESTING
Panel B

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln total\ invested\ capital_{it} + e_{it}$

Statistic	
Number of Observations	8432
Dependent Variable	lnMVA
Independent Variable	lnTIC
R-Squared	0.1409
Coefficients:	
Constant	-0.3355091
Std. error	0.011583
95% C.I.	-0.3582152/-0.3128031
Independent Variable (lnTIC)	1.042992
Std. error	0.0331628
95% C.I.	0.9779834/1.108
t-statistics:	
Constant	-28.97
Independent Variable (lnTIC)	31.45
p-value:	
Constant	0.000
Independent Variable (lnTIC)	0.000

TABLE 5.11 (continued)
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (3) TESTING
Panel C

Model: $\ln MVA_{it} = \gamma_0 + \gamma_1 \ln Lagged\ EVA_{it} + e_{it}$

Statistic	
Number of Observations	3970
Dependent Variable	lnMVA
Independent Variable	lnLagEVA
R-Squared	0.3020
Coefficients:	
Constant	0.7036367
Std. error	0.0487725
95% C.I.	0.6080079/0.7992655
Independent Variable (lnLagEVA)	0.1427
Std. error	0.013955
95% C.I.	0.1153382/0.1700617
t-statistics:	
Constant	14.43
Independent Variable (lnLagEVA)	10.23
p-value:	
Constant	0.000
Independent Variable (lnLagEVA)	0.000

TABLE 5.11 (continued)
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (3) TESTING
Panel D

Model: $\boxed{\ln MVA_{it} = \delta_0 + \delta_1 \ln TSR_{it} + e_{it}}$

Statistic	
Number of Observations	4966
Dependent Variable	lnMVA
Independent Variable	lnTSR
R-Squared	0.0570
Coefficients:	
Constant	0.1249479
Std. error	0.0193188
95% C.I.	0.0870726/0.1628232
Independent Variable (lnTSR)	0.1202252
Std. error	0.0114126
95% C.I.	0.0978502/0.1426001
t-statistics:	
Constant	6.47
Independent Variable (lnTSR)	10.53
p-value:	
Constant	0.000
Independent Variable (lnTSR)	0.000

TABLE 5.11 (continued)
STATISTICAL RESULTS OF STEP ONE OF HYPOTHESIS (3) TESTING
Panel E

Model: $\ln MVA_{it} = \pi_0 + \pi_1 \ln Tobin's\ Q_{it} + e_{it}$

Statistic	
Number of Observations	6715
Dependent Variable	lnMVA
Independent Variable	lnTobin'sQ
R-Squared	0.3480
Coefficients:	
Constant	2.8353
Std. error	0.0753512
95% C.I.	2.687584/2.983016
Independent Variable (lnTobin'sQ)	0.4931501
Std. error	0.0124448
95% C.I.	0.4687538/0.5175465
t-statistics:	
Constant	37.63
Independent Variable (lnTobin'sQ)	39.63
p-value:	
Constant	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.12
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel A

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it}$

Statistic	
Number of Observations	3686
Dependent Variable	lnMVA
Independent Variable	lnSPREAD, lnTobin'sQ
R-Squared	0.4311
Coefficients:	
Constant	3.41377
Std. error	0.1026209
95% C.I.	3.212555/3.614984
Independent Variable (lnSPREAD)	0.1477277
Std. error	0.0105464
95% C.I.	0.1270488/0.1684066
Independent Variable (lnTobin'sQ)	0.2639882
Std. error	0.0175321
95% C.I.	0.2296119/0.2983644
t-statistics:	
Constant	33.27
Independent Variable (lnSPREAD)	14.01
Independent Variable (lnTobin'sQ)	15.06
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.12 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel B

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(TSR_{it}) + e_{it}$

Statistic	
Number of Observations	2902
Dependent Variable	lnMVA
Independent Variable	lnSPREAD, lnTSR
R-Squared	0.3794
Coefficients:	
Constant	2.959312
Std. error	0.114416
95% C.I.	2.734938/3.183686
Independent Variable (lnSPREAD)	0.2284903
Std. error	0.010361
95% C.I.	0.208168/0.2488127
Independent Variable (lnTSR)	0.0918727
Std. error	0.0106942
95% C.I.	0.0709009
t-statistics:	
Constant	25.86
Independent Variable (lnSPREAD)	22.05
Independent Variable (lnTSR)	8.59
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000
Independent Variable (lnTSR)	0.000

TABLE 5.12 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel C

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(TIC_{it}) + e_{it}$

Statistic	
Number of Observations	4429
Dependent Variable	lnMVA
Independent Variable	lnSPREAD, lnTIC
R-Squared	0.4029
Coefficients:	
Constant	2.399658
Std. error	0.0925747
95% C.I.	2.218154/2.581162
Independent Variable (lnSPREAD)	0.2058962
Std. error	0.0082986
95% C.I.	0.1896257/0.2221667
Independent Variable (lnTIC)	0.5441606
Std. error	0.0345928
95% C.I.	0.4763372/0.6119839
t-statistics:	
Constant	25.92
Independent Variable (lnSPREAD)	24.81
Independent Variable (lnTIC)	15.73
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000
Independent Variable (lnTIC)	0.000

TABLE 5.12 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel D

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(profitability\ spread_{it}) + \beta_2 \ln(Lagged\ EVA_{it}) + e_{it}$

Statistic	
Number of Observations	3261
Dependent Variable	lnMVA
Independent Variable	lnSPREAD, lnLagEVA
R-Squared	0.4030
Coefficients:	
Constant	3.249292
Std. error	0.1111003
95% C.I.	3.031438/3.467147
Independent Variable (lnSPREAD)	0.2548422
Std. error	0.0103714
95% C.I.	0.2345052/0.2751793
Independent Variable (lnLagEVA)	0.0448538
Std. error	0.0140203
95% C.I.	0.0173616/0.0723459
t-statistics:	
Constant	29.25
Independent Variable (lnSPREAD)	24.57
Independent Variable (lnLagEVA)	3.20
p-value:	
Constant	0.000
Independent Variable (lnSPREAD)	0.000
Independent Variable (lnLagEVA)	0.000

TABLE 5.12(continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel E

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(total\ invested\ capital_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it}$

Statistic	
Number of Observations	6712
Dependent Variable	lnMVA
Independent Variable	lnTIC, lnTobin'sQ
R-Squared	0.3784
Coefficients:	
Constant	2.246136
Std. error	0.081698
95% C.I.	2.085977/2.406294
Independent Variable (lnTIC)	0.6485643
Std. error	0.0389131
95% C.I.	0.5722803/0.7248484
Independent Variable (lnTobin'sQ)	0.4136267
Std. error	0.013066
95% C.I.	0.3880125/0.439241
t-statistics:	
Constant	27.49
Independent Variable (lnTIC)	16.67
Independent Variable (lnTobin'sQ)	31.66
p-value:	
Constant	0.000
Independent Variable (lnTIC)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.12 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel F

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(total\ invested\ capital_{it}) + \beta_2 \ln(TSR_{it}) + e_{it}$

Statistic	
Number of Observations	4964
Dependent Variable	lnMVA
Independent Variable	lnTIC, lnTSR
R-Squared	0.1595
Coefficients:	
Constant	-0.0371087
Std. error	0.020153
95% C.I.	-0.0766195/0.0024021
Independent Variable (lnTIC)	0.8733576
Std. error	0.0437758
95% C.I.	0.7875333
Independent Variable (lnTSR)	0.1153032
Std. error	0.0109023
95% C.I.	0.0939288/0.1366775
t-statistics:	
Constant	-1.84
Independent Variable (lnTIC)	19.95
Independent Variable (lnTSR)	-1.84
p-value:	
Constant	0.000
Independent Variable (lnTIC)	0.000
Independent Variable (lnTSR)	0.066

TABLE 5.12 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel G

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(Lagged\ EVA_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it}$

Number of Observations	3313
Dependent Variable	lnMVA
Independent Variable	lnLagEVA, lnTobin'sQ
R-Squared	0.4277
Coefficients:	
Constant	3.369323
Std. error	0.0981309
95% C.I.	3.176901/3.561745
Independent Variable (lnLagEVA)	0.06623305
Std. error	0.0131242
95% C.I.	0.040957/0.0919653
Independent Variable (lnTobin'sQ)	0.4924473
Std. error	0.0161722
95% C.I.	0.4607358/0.5241589
t-statistics:	
Constant	34.33
Independent Variable (lnLagEVA)	5.05
Independent Variable (lnTobin'sQ)	30.45
p-value:	
Constant	0.000
Independent Variable (lnLagEVA)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.12 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel H

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(Lagged\ EVA_{it}) + \beta_2 \ln(TSR_{it}) + e_{it}$

Number of Observations	2576
Dependent Variable	lnMVA
Independent Variable	lnLagEVA, lnTSR
R-Squared	0.3156
Coefficients:	
Constant	0.9106314
Std. error	0.0624719
95% C.I.	0.7881103/1.033152
Independent Variable (lnLagEVA)	0.1326416
Std. error	0.0173883
95% C.I.	0.0985394/0.1667438
Independent Variable (lnTSR)	0.1196001
Std. error	0.0128377
95% C.I.	0.0944226/0.1447776
t-statistics:	
Constant	14.58
Independent Variable (lnLagEVA)	7.63
Independent Variable (lnTSR)	9.32
p-value:	
Constant	0.000
Independent Variable (lnLagEVA)	0.000
Independent Variable (lnTSR)	0.000

TABLE 5.12 (continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel I

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(total\ invested\ capital_{it}) + \beta_2 \ln(Lagged\ EVA_{it}) + e_{it}$

Number of Observations	3966
Dependent Variable	lnMVA
Independent Variable	lnTIC, lnLagEVA
R-Squared	0.2844
Coefficients:	
Constant	0.4753706
Std. error	0.0488642
95% C.I.	0.379562/0.5711792
Independent Variable (lnTIC)	0.6940391
Std. error	0.038546
95% C.I.	0.6184601/0.769618
Independent Variable (lnLagEVA)	0.1156793
Std. error	0.0135523
95% C.I.	0.0891071/0.1422515
t-statistics:	
Constant	9.73
Independent Variable (lnTIC)	18.01
Independent Variable (lnLagEVA)	8.54
p-value:	
Constant	0.000
Independent Variable (lnTIC)	0.000
Independent Variable (lnLagEVA)	0.000

TABLE 5.12(continued)
STATISTICAL RESULTS OF STEP TWO OF HYPOTHESIS (3) TESTING
Panel J

Model: $\ln MVA_{it} = \beta_0 + \beta_1 \ln(TSR_{it}) + \beta_2 \ln(Tobin's\ Q_{it}) + e_{it}$

Number of Observations	4410
Dependent Variable	lnMVA
Independent Variable	lnTSR, lnTobin'sQ
R-Squared	0.3566
Coefficients:	
Constant	2.835656
Std. error	0.0968174
95% C.I.	2.645834/3.025478
Independent Variable (lnTSR)	0.0940835
Std. error	0.0110063
95% C.I.	0.0725042/0.1156627
Independent Variable (lnTobin'sQ)	0.4528348
Std. error	0.0160809
95% C.I.	0.4213063/0.4843633
t-statistics:	
Constant	29.29
Independent Variable (lnTSR)	8.55
Independent Variable (lnTobin'sQ)	28.16
p-value:	
Constant	0.000
Independent Variable (lnTSR)	0.000
Independent Variable (lnTobin'sQ)	0.000

TABLE 5.13

HYPOTHESIS (3)

RELATIVE VALUE-RELEVANCE TEST

Panel A
Relative Value-Relevance Test
(individual)

	Profitability Spread		Tobin's Q		Lagged EVA		Total Invested Capital		Total Shareholder Return	
R^2	38.65%	>	34.80%	>	30.20%	>	14.09%	>	5.70%	

Panel B
RELATIVE VALUE-RELEVANCE TEST
(pair-wise combinations in order of decreasing power)

Pair-Wise Combination	R^2
Profitability Spread / Tobin's Q	43.11
Lagged EVA / Tobin's Q	42.77
Profitability Spread / Lagged EVA	40.30
Profitability Spread / Total Invested Capital	40.29
Profitability Spread / Total Shareholder Return	37.94
Total Invested Capital / Tobin's Q	37.84
Total Shareholder Return / Tobin's Q	35.66
Lagged EVA / Total Shareholder Return	31.56
Total Invested Capital / Lagged EVA	28.44
Total Invested Capital / Total Shareholder Return	15.95

TABLE 5.14

HYPOTHESIS 3

INCREMENTAL VALUE-RELEVANCE TEST

Pair-Wise Combination	Incremental Value-relevance %
Profitability Spread / Tobin's Q	8.31
Lagged EVA / Tobin's Q	7.97
Profitability Spread / Lagged EVA	10.10
Profitability Spread / Total Invested Capital	26.20
Profitability Spread / Total Shareholder Return	32.24
Total Invested Capital / Tobin's Q	3.04
Total Shareholder Return / Tobin's Q	0.86
Lagged EVA / Total Shareholder Return	25.86
Total Invested Capital / Lagged EVA	-1.76
Total Invested Capital / Total Shareholder Return	10.25
Tobin's Q / Profitability Spread	4.46
Tobin's Q / Lagged EVA	12.57
Lagged EVA / Profitability Spread	1.65
Total Invested Capital / Profitability Spread	1.64
Total Shareholder Return / Profitability Spread	-0.81
Tobin's Q / Total Invested Capital	23.75
Tobin's Q / Total Shareholder Return	29.96
Total Shareholder Return / Lagged EVA	1.36
Lagged EVA / Total Invested Capital	14.35
Total Shareholder Return / Total Invested Capital	1.86

Appendix C:
The 2002 Stern Stewart Performance 1000

Top 1000 Creators of Shareholder Wealth among U.S. Companies, 1998-2002
Market Value Added (MVA)

The 2002 Stern Stewart Performance 1000

Top 1000 Creators of Shareholder Wealth Among U.S. Companies, 1998-2002

MVA

Rank 2002	Rank 2001	Rank 1998	Ticker	Company name	Industry Code	Industry Name
1	2	1	MSFT	Microsoft Corp	4510	Software & Services
2	3	6	WMT	Wal-Mart Stores	2550	Retailing
3	1	2	GE	General Electric Co	2010	Capital Goods
4	5	16	JNJ	Johnson & Johnson	3520	Pharmaceuticals & Biotech
5	12	15	PFE	Pfizer Inc	3520	Pharmaceuticals & Biotech
6	10	10	MRK	Merck & Co	3520	Pharmaceuticals & Biotech
7	11	20	PG	Procter & Gamble Co	3030	Household & Personal Prods
8	14	13	IBM	Intl Business Machines Corp	4520	Technology Hardware & Equip
9	8	11	XOM	Exxon Mobil Corp	1010	Energy
10	9	8	KO	Coca-Cola Co	3020	Food Beverage & Tobacco
11	6	3	INTC	Intel Corp	4520	Technology Hardware & Equip
12	20	18	DELL	Dell Computer Corp	4520	Technology Hardware & Equip
13	4	.	C	Citigroup Inc	4020	Diversified Financials
14	21	5	CSCO	Cisco Systems Inc	4520	Technology Hardware & Equip
15	24	51	ORCL	Oracle Corp	4510	Software & Services
16	25	58	AMGN	Amgen Inc	3520	Pharmaceuticals & Biotech
17	19	25	LLY	Lilly (Eli) & Co	3520	Pharmaceuticals & Biotech
18	23	.	UPS	United Parcel Service Inc	2030	Transportation
19	18	.	FNM	Fannie Mae	4020	Diversified Financials
20	16	44	PEP	Pepsico Inc	3020	Food Beverage & Tobacco
21	17	21	MO	Altria Group Inc	3020	Food Beverage & Tobacco
22	15	30	ABT	Abbott Laboratories	3520	Pharmaceuticals & Biotech
23	13	23	HD	Home Depot Inc	2550	Retailing
24	29	62	MMM	3M Co	2010	Capital Goods
25	7	.	AIG	American International Group	4030	Insurance
26	30	48	MDT	Medtronic Inc	3510	Health Care Equipment & Svcs
27	22	28	WYE	Wyeth	3520	Pharmaceuticals & Biotech
28	71	74	CMCSA	Comcast Corp	2540	Media
29	27	59	BUD	Anheuser-Busch Cos Inc	3020	Food Beverage & Tobacco
30	36	33	DD	Du Pont (E I) De Nemours	1510	Materials
31	39	75	PHA	Pharmacia Corp	3520	Pharmaceuticals & Biotech

32	28	17	BMY	Bristol Myers Squibb	3520	Pharmaceuticals & Biotech
33	35	.	FRE	Federal Home Loan Mortg Corp	4020	Diversified Financials
34	92	63	EBAY	eBay Inc	2550	Retailing
35	34	.	AXP	American Express	4020	Diversified Financials
36	49	67	CL	Colgate-Palmolive Co	3030	Household & Personal Prods
37	46	98	LOW	Lowes Cos	2550	Retailing
38	48	198	UNH	Unitedhealth Group Inc	3510	Health Care Equipment & Svcs
39	33	73	WAG	Walgreen Co	3010	Food & Drug Retailing
40	47	.	WFC	Wells Fargo & Co	4010	Banks
41	26	.	KFT	Kraft Foods Inc	3020	Food Beverage & Tobacco
42	37	32	BLS	Bellsouth Corp	5010	Telecommunication Services
43	63	.	BAC	Bank Of America Corp	4010	Banks
44	40	69	TGT	Target Corp	2550	Retailing
45	59	156	FDC	First Data Corp	2020	Commercial Svcs & Supplies
46	68	90	QCOM	Qualcomm Inc	4520	Technology Hardware & Equip
47	96	344	FRX	Forest Laboratories -Cl A	3520	Pharmaceuticals & Biotech
48	53	46	G	Gillette Co	3030	Household & Personal Prods
49	67	167	SYY	Sysco Corp	3010	Food & Drug Retailing
50	42	27	VZ	Verizon Communications	5010	Telecommunication Services
51	54	.	MMC	Marsh & Mclennan Cos	4030	Insurance
52	60	68	UTX	United Technologies Corp	2010	Capital Goods
53	41	31	SGP	Schering-Plough	3520	Pharmaceuticals & Biotech
54	55	140	KSS	Kohls Corp	2550	Retailing
55	102	.	SLM	SLM Corp	4020	Diversified Financials
56	73	84	COX	Cox Communications -Cl A	2540	Media
57	85	227	DISH	Echostar Commun Corp -Cl A	2540	Media
58	32	.	MWD	Morgan Stanley	4020	Diversified Financials
59	56	.	FITB	Fifth Third Bancorp	4010	Banks
60	31	52	TXN	Texas Instruments Inc	4520	Technology Hardware & Equip
61	80	91	GCI	Gannett Co	2540	Media
62	82	77	EMR	Emerson Electric Co	2010	Capital Goods
63	45	72	ADP	Automatic Data Processing	2020	Commercial Svcs & Supplies
64	180	54	L	Liberty Media Corp -Ser A	2540	Media
65	124	.	AFL	Aflac Inc	4030	Insurance
66	38	87	AMAT	Applied Materials Inc	4520	Technology Hardware & Equip
67	64	148	LMT	Lockheed Martin Corp	2010	Capital Goods
68	99	163	SO	Southern Co	5510	Utilities
69	97	131	GIS	General Mills Inc	3020	Food Beverage & Tobacco
70	166	53	AMZN	Amazon.Com Inc	2550	Retailing
71	103	117	AVP	Avon Products	3030	Household & Personal Prods
72	128	224	SYK	Stryker Corp	3510	Health Care Equipment & Svcs
73	341	127	NXTL	Nextel Communications	5010	Telecommunication Services
74	270	110	BSX	Boston Scientific Corp	3510	Health Care Equipment & Svcs
75	51	.	GS	Goldman Sachs Group Inc	4020	Diversified Financials
76	81	170	HDI	Harley-Davidson Inc	2510	Automobiles & Components
77	118	173	DNA	Genentech Inc	3520	Pharmaceuticals & Biotech
78	111	153	WWY	Wrigley (Wm) Jr Co	3020	Food Beverage & Tobacco

79	65	78	VIA.B	Viacom Inc -Cl B	2540	Media
80	75	162	MXIM	Maxim Integrated Products	4520	Technology Hardware & Equip
81	131	47	GPS	Gap Inc	2550	Retailing
82	116	241	BBBY	Bed Bath & Beyond Inc	2550	Retailing
83	100	116	K	Kellogg Co	3020	Food Beverage & Tobacco
84	93	179	PAYX	Paychex Inc	2020	Commercial Svcs & Supplies
85	151	82	DOW	Dow Chemical	1510	Materials
86	89	94	ITW	Illinois Tool Works	2010	Capital Goods
87	135	187	TRB	Tribune Co	2540	Media
88	90	100	COST	Costco Wholesale Corp	2550	Retailing
89	58	.	KRB	Mbna Corp	4020	Diversified Financials
90	110	119	FOX	Fox Entertainment Group Inc	2540	Media
91	126	36	EMC	EMC Corp/Ma	4520	Technology Hardware & Equip
92	105	158	LLTC	Linear Technology Corp	4520	Technology Hardware & Equip
93	145	.	PGR	Progressive Corp-Ohio	4030	Insurance
94	62	43	DIS	Disney (Walt) Co	2540	Media
95	109	243	ADI	Analog Devices	4520	Technology Hardware & Equip
96	186	438	APOL	Apollo Group Inc -Cl A	2020	Commercial Svcs & Supplies
97	106	144	LUV	Southwest Airlines	2030	Transportation
98	179	.	ZMH	Zimmer Hldgs Inc	3510	Health Care Equipment & Svcs
99	84	125	OMC	Omnicom Group	2540	Media
100	107	157	CAT	Caterpillar Inc	2010	Capital Goods
101	50	38	MCD	McDonalds Corp	2530	Hotels Restaurants & Leisure
102	115	145	TJX	Tjx Companies Inc	2550	Retailing
103	981	104	CCU	Clear Channel Communications	2540	Media
104	222	528	GILD	Gilead Sciences Inc	3520	Pharmaceuticals & Biotech
105	119	151	MHP	McGraw-Hill Companies	2540	Media
106	182	186	LXK	Lexmark Intl Inc -Cl A	4520	Technology Hardware & Equip
107	181	139	FDX	Fedex Corp	2030	Transportation
108	157	101	CVC	Cablevision Sys Corp -Cl A	2540	Media
109	121	367	D	Dominion Resources Inc	5510	Utilities
110	138	96	GDT	Guidant Corp	3510	Health Care Equipment & Svcs
111	69	176	GD	General Dynamics Corp	2010	Capital Goods
112	52	.	BK	Bank Of New York Co Inc	4010	Banks
113	146	201	SBUX	Starbucks Corp	2530	Hotels Restaurants & Leisure
114	57	.	MER	Merrill Lynch & Co	4020	Diversified Financials
115	86	147	BBY	Best Buy Co Inc	2550	Retailing
116	156	264	EXC	Exelon Corp	5510	Utilities
117	70	83	KMB	Kimberly-Clark Corp	3030	Household & Personal Prods
118	43	108	BAX	Baxter International Inc	3510	Health Care Equipment & Svcs
119	108	109	SLE	Sara Lee Corp	3020	Food Beverage & Tobacco
120	213	711	STJ	St Jude Medical Inc	3510	Health Care Equipment & Svcs
121	123	113	GMH	General Motors Cl H	2540	Media
122	176	246	AGN	Allergan Inc	3520	Pharmaceuticals & Biotech
123	112	103	HNZ	Heinz (H J) Co	3020	Food Beverage & Tobacco
124	72	111	CAH	Cardinal Health Inc	3510	Health Care Equipment & Svcs
125	136	.	ALL	Allstate Corp	4030	Insurance

126	130	311	WLP	Wellpoint Hlth Netwrk -Cl A	3510	Health Care Equipment & Svcs
127	122	95	CPB	Campbell Soup Co	3020	Food Beverage & Tobacco
128	152	317	AZO	Autozone Inc	2550	Retailing
129	129	88	PBI	Pitney Bowes Inc	2020	Commercial Svcs & Supplies
130	104	192	XLNX	Xilinx Inc	4520	Technology Hardware & Equip
131	209	222	PX	Praxair Inc	1510	Materials
132	148	213	HSY	Hershey Foods Corp	3020	Food Beverage & Tobacco
133	173	182	CAG	Conagra Foods Inc	3020	Food Beverage & Tobacco
134	147	189	DHR	Danaher Corp	2010	Capital Goods
135	127	106	NKE	Nike Inc -Cl B	2520	Consumer Durables & Apparel
136	114	.	STI	Suntrust Banks Inc	4010	Banks
137	153	256	ITT	ITT Industries Inc	2010	Capital Goods
138	139	343	ADBE	Adobe Systems Inc.	4510	Software & Services
139	155	393	ERTS	Electronic Arts Inc	4510	Software & Services
140	259	.	EXPE	Expedia Inc	4510	Software & Services
141	77	34	HPQ	Hewlett-Packard Co	4520	Technology Hardware & Equip
142	185	271	BMET	Biomet Inc	3510	Health Care Equipment & Svcs
143	169	301	MEDI	Medimmune Inc	3520	Pharmaceuticals & Biotech
144	165	115	SPLS	Staples Inc	2550	Retailing
145	178	305	UCOMA	Unitedglobalcom Inc -Cl A	2540	Media
146	189	245	NYT	New York Times Co -Cl A	2540	Media
147	211	526	IGT	Intl Game Technology	2530	Hotels Restaurants & Leisure
148	174	183	BDX	Becton Dickinson & Co	3510	Health Care Equipment & Svcs
149	91	.	STT	State Street Corp	4020	Diversified Financials
150	201	120	CLX	Clorox Co/De	3030	Household & Personal Prods
151	78	99	AA	Alcoa Inc	1510	Materials
152	133	136	YUM	Yum Brands Inc	2530	Hotels Restaurants & Leisure
153	237	.	GDW	Golden West Financial Corp	4010	Banks
154	191	431	GENZ	Genzyme Corp	3520	Pharmaceuticals & Biotech
155	200	262	INTU	Intuit Inc	4510	Software & Services
156	95	.	MEL	Mellon Financial Corp	4010	Banks
157	192	292	HRB	Block H & R Inc	2020	Commercial Svcs & Supplies
158	243	249	ECL	Ecolab Inc	1510	Materials
159	245	259	WPO	Washington Post -Cl B	2540	Media
160	140	135	LTD	Limited Brands Inc	2550	Retailing
161	143	229	UVN	Univision Communications Inc	2540	Media
162	214	546	CHIR	Chiron Corp	3520	Pharmaceuticals & Biotech
163	184	188	APD	Air Products & Chemicals Inc	1510	Materials
164	187	132	EL	Lauder Estee Cos Inc -Cl A	3030	Household & Personal Prods
165	261	.	WTW	Weight Watchers Intl Inc	2550	Retailing
166	216	236	FPL	FPL Group Inc	5510	Utilities
167	221	293	FDO	Family Dollar Stores	2550	Retailing
168	226	355	SSP	EW Scripps -Cl A	2540	Media
169	132	401	KLAC	Kla-Tencor Corp	4520	Technology Hardware & Equip
170	74	270	HCA	HCA Inc	3510	Health Care Equipment & Svcs
171	287	762	SYMC	Symantec Corp	4510	Software & Services
172	175	194	ALTR	Altera Corp	4520	Technology Hardware & Equip

173	177	493	ACS	Affiliated Comp Svcs -Cl A	4510	Software & Services
174	188	255	UST	UST Inc	3020	Food Beverage & Tobacco
175	266	514	APA	Apache Corp	1010	Energy
176	158	166	MAR	Marriott Intl Inc	2530	Hotels Restaurants & Leisure
177	203	124	AT	Alltel Corp	5010	Telecommunication Services
178	247	184	PPG	PPG Industries Inc	1510	Materials
179	250	586	BJS	BJ Services Co	1010	Energy
180	171	.	LEH	Lehman Brothers Holdings Inc	4020	Diversified Financials
181	134	477	NEM	Newmont Mining Corp	1510	Materials
182	168	302	VRTS	Veritas Software Co	4510	Software & Services
183	149	225	BHI	Baker-Hughes Inc	1010	Energy
184	162	288	APC	Anadarko Petroleum Corp	1010	Energy
185	960	37	YHOO	Yahoo Inc	4510	Software & Services
186	227	.	BEN	Franklin Resources Inc	4020	Diversified Financials
187	232	.	ATH	Anthem Inc	3510	Health Care Equipment & Svcs
188	256	350	KRI	Knight-Ridder Inc	2540	Media
189	284	286	BF.B	Brown-Forman -Cl B	3020	Food Beverage & Tobacco
190	142	575	IDPH	IDEC Pharmaceuticals Corp	3520	Pharmaceuticals & Biotech
191	263	.	SOTR	Southtrust Corp	4010	Banks
192	280	374	PPL	PPL Corp	5510	Utilities
193	241	287	PEG	Public Service Entrp	5510	Utilities
194	172	207	CTAS	Cintas Corp	2020	Commercial Svcs & Supplies
195	240	436	DE	Deere & Co	2010	Capital Goods
196	225	204	AVY	Avery Dennison Corp	2020	Commercial Svcs & Supplies
197	161	986	DGX	Quest Diagnostics Inc	3510	Health Care Equipment & Svcs
198	101	168	CI	Cigna Corp	3510	Health Care Equipment & Svcs
199	76	266	CE	Concord Efs Inc	2020	Commercial Svcs & Supplies
200	390	.	COH	Coach Inc	2520	Consumer Durables & Apparel
201	231	193	BGEN	Biogen Inc	3520	Pharmaceuticals & Biotech
202	255	.	CINF	Cincinnati Financial Corp	4030	Insurance
203	258	394	ESRX	Express Scripts Inc	3510	Health Care Equipment & Svcs
204	113	.	NTRS	Northern Trust Corp	4010	Banks
205	450	441	MYL	Mylan Laboratories	3520	Pharmaceuticals & Biotech
206	492	.	CFC	Countrywide Financial Corp	4020	Diversified Financials
207	150	196	MAS	Masco Corp	2010	Capital Goods
208	224	.	RMK	Aramark Corp	2020	Commercial Svcs & Supplies
209	343	494	EXPD	Expeditors Intl Wash Inc	2030	Transportation
210	262	212	DG	Dollar General Corp	2550	Retailing
211	276	214	ROH	Rohm & Haas Co	1510	Materials
212	230	218	DOV	Dover Corp	2010	Capital Goods
213	352	956	VAR	Varian Medical Systems Inc	3510	Health Care Equipment & Svcs
214	234	276	NTAP	Network Appliance Inc	4520	Technology Hardware & Equip
215	204	141	RX	IMS Health Inc	3510	Health Care Equipment & Svcs
216	274	373	ASD	American Standard Cos Inc	2010	Capital Goods
217	217	327	PGN	Progress Energy Inc	5510	Utilities
218	44	39	CVX	Chevrontexaco Corp	1010	Energy
219	353	717	BRL	Barr Laboratories Inc	3520	Pharmaceuticals & Biotech

220	326	.	FTN	First Tennessee Natl Corp	4010	Banks
221	275	469	EOG	EOG Resources Inc	1010	Energy
222	295	319	GPC	Genuine Parts Co	2550	Retailing
223	183	308	FISV	Fiserv Inc	2020	Commercial Svcs & Supplies
224	206	.	SNV	Synovus Financial Cp	4010	Banks
225	298	840	KMI	Kinder Morgan Inc	5510	Utilities
226	272	306	TSS	Total System Services Inc	2020	Commercial Svcs & Supplies
227	271	267	JCI	Johnson Controls Inc	2510	Automobiles & Components
228	196	.	BBT	BB&T Corp	4010	Banks
229	220	484	MCHP	Microchip Technology Inc	4520	Technology Hardware & Equip
230	316	640	BEAS	Bea Systems Inc	4510	Software & Services
231	125	150	COP	Conocophillips	1010	Energy
232	325	550	PCAR	Paccar Inc	2510	Automobiles & Components
233	400	758	WFMI	Whole Foods Market Inc	3010	Food & Drug Retailing
234	344	.	MTB	M & T Bank Corp	4010	Banks
235	301	425	OXY	Occidental Petroleum Corp	1010	Energy
236	318	459	MKC	McCormick & Co	3020	Food Beverage & Tobacco
237	257	281	HLT	Hilton Hotels Corp	2530	Hotels Restaurants & Leisure
238	292	.	NFB	North Fork Bancorporation	4010	Banks
239	330	412	SIAL	Sigma-Aldrich	1510	Materials
240	252	453	CDWC	Cdw Computer Centers Inc	2550	Retailing
241	332	269	ETN	Eaton Corp	2010	Capital Goods
242	328	205	UNP	Union Pacific Corp	2030	Transportation
243	233	381	TIF	Tiffany & Co	2550	Retailing
244	317	601	WON	Westwood One Inc	2540	Media
245	388	562	CHRW	C H Robinson Worldwide Inc	2030	Transportation
246	459	427	PIXR	Pixar	2540	Media
247	198	230	WY	Weyerhaeuser Co	1510	Materials
248	120	93	PCS	Sprint Pcs Group	5010	Telecommunication Services
249	194	64	WMI	Waste Management Inc	2020	Commercial Svcs & Supplies
250	260	.	JP	Jefferson-Pilot Corp	4030	Insurance
251	361	404	AEE	Ameren Corp	5510	Utilities
252	190	360	AEP	American Electric Power	5510	Utilities
253	279	329	HMA	Health Management Assoc	3510	Health Care Equipment & Svcs
254	304	.	WM	Washington Mutual Inc	4010	Banks
255	202	388	SDS	Sungard Data Systems Inc	4510	Software & Services
256	83	.	SCH	Schwab (Charles) Corp	4020	Diversified Financials
257	538	.	HCBK	Hudson City Bancorp	4010	Banks
258	336	365	FCX	Freeprt Mcmor Cop&Gld -Cl B	1510	Materials
259	160	322	USAI	USA Interactive	2550	Retailing
260	269	210	RSH	Radioshack Corp	2550	Retailing
261	404	407	FE	Firstenergy Corp	5510	Utilities
262	223	573	ABC	Amerisourcebergen Corp	3510	Health Care Equipment & Svcs
263	379	238	ANF	Abercrombie & Fitch -Cl A	2550	Retailing
264	265	437	HET	Harrahs Entertainment Inc	2530	Hotels Restaurants & Leisure
265	299	675	CPS	Choicepoint Inc	2020	Commercial Svcs & Supplies
266	447	806	XTO	XTO Energy Inc	1010	Energy

267	322	498	WSM	Williams-Sonoma Inc	2550	Retailing
268	565	832	DRYR	Dreyer's Grand Ice Cream Inc	3020	Food Beverage & Tobacco
269	307	250	EFX	Equifax Inc	2020	Commercial Svcs & Supplies
270	293	.	FII	Federated Investors Inc	4020	Diversified Financials
271	239	.	SEIC	Sei Investments Co	4020	Diversified Financials
272	363	203	DNB	Dun & Bradstreet Corp	2020	Commercial Svcs & Supplies
273	238	295	MOLX	Molex Inc	4520	Technology Hardware & Equip
274	244	199	UCL	Unocal Corp	1010	Energy
275	410	.	ROOM	Hotels.Com	4510	Software & Services
276	338	576	MERQ	Mercury Interactive Corp	4510	Software & Services
277	285	253	ED	Consolidated Edison Inc	5510	Utilities
278	207	415	PBG	Pepsi Bottling Group Inc	3020	Food Beverage & Tobacco
279	342	524	LNCR	Lincare Holdings Inc	3510	Health Care Equipment & Svcs
280	337	.	COL	Rockwell Collins Inc	2010	Capital Goods
281	335	445	ROST	Ross Stores Inc	2550	Retailing
282	541	282	CTXS	Citrix Systems Inc	4510	Software & Services
283	288	303	DJ	Dow Jones & Co Inc	2540	Media
284	470	756	IRM	Iron Mountain Inc	2020	Commercial Svcs & Supplies
285	461	870	CECO	Career Education Corp	2020	Commercial Svcs & Supplies
286	167	.	PNC	PNC Financial Svcs Group Inc	4010	Banks
287	355	280	JBL	Jabil Circuit Inc	4520	Technology Hardware & Equip
288	368	456	CIN	Cinergy Corp	5510	Utilities
289	371	540	QLGC	Qlogic Corp	4520	Technology Hardware & Equip
290	814	958	WFR	Memc Electronic Matrials Inc	4520	Technology Hardware & Equip
291	302	.	TROW	Price (T. Rowe) Group	4020	Diversified Financials
292	401	.	JNPR	Juniper Networks Inc	4520	Technology Hardware & Equip
293	394	564	LIZ	Liz Claiborne Inc	2520	Consumer Durables & Apparel
294	378	510	EAT	Brinker Intl Inc	2530	Hotels Restaurants & Leisure
295	451	617	BLL	Ball Corp	1510	Materials
296	297	332	GWW	Grainger (W W) Inc	2010	Capital Goods
297	387	790	NVR	NVR Inc	2520	Consumer Durables & Apparel
298	384	911	ETR	Entergy Corp	5510	Utilities
299	438	972	DF	Dean Foods Co	3020	Food Beverage & Tobacco
300	340	468	FAST	Fastenal Co	2010	Capital Goods
301	417	.	PFG	Principal Financial Grp Inc	4020	Diversified Financials
302	315	959	CMX	Caremark Rx Inc	3510	Health Care Equipment & Svcs
303	423	495	SRE	Sempra Energy	5510	Utilities
304	331	313	WAT	Waters Corp	4520	Technology Hardware & Equip
305	449	458	BCR	Bard (C.R.) Inc	3510	Health Care Equipment & Svcs
306	366	134	CCE	Coca-Cola Enterprises	3020	Food Beverage & Tobacco
307	357	592	PDCO	Patterson Dental Co	3510	Health Care Equipment & Svcs
308	437	.	LM	Legg Mason Inc	4020	Diversified Financials
309	516	372	NWAC	Northwest Airlines Corp	2030	Transportation
310	370	613	XRAY	Dentsply Internatl Inc	3510	Health Care Equipment & Svcs
311	359	316	SHW	Sherwin-Williams Co	2550	Retailing
312	264	512	LLL	L-3 Communications Hldgs Inc	2010	Capital Goods
313	248	348	HOT	Starwood Hotels&Resorts Wrld	2530	Hotels Restaurants & Leisure

314	212	979	LH	Laboratory Cp Of Amer Hldgs	3510	Health Care Equipment & Svcs
315	372	623	ACV	Alberto-Culver Co -Cl B	3030	Household & Personal Prods
316	381	448	DLX	Deluxe Corp	2020	Commercial Svcs & Supplies
317	554	.	PTV	Pactiv Corp	1510	Materials
318	345	687	FHCC	First Health Group Corp	3510	Health Care Equipment & Svcs
319	154	.	MET	Metlife Inc	4030	Insurance
320	402	334	IFF	Intl Flavors & Fragrances	1510	Materials
321	432	937	OEI	Ocean Energy Inc	1010	Energy
322	413	248	ABI	Applera Corp Applied Biosys	3510	Health Care Equipment & Svcs
323	267	467	RHI	Robert Half Intl Inc	2020	Commercial Svcs & Supplies
324	334	352	HB	Hillenbrand Industries	3510	Health Care Equipment & Svcs
325	393	451	HRL	Hormel Foods Corp	3020	Food Beverage & Tobacco
326	306	.	ABK	Ambac Financial Gp	4030	Insurance
327	350	.	TCB	TCF Financial Corp	4010	Banks
328	442	896	PTEN	Patterson-Uti Energy Inc	1010	Energy
329	365	718	ADVP	Advancepcs	3510	Health Care Equipment & Svcs
330	235	391	PSFT	Peoplesoft Inc	4510	Software & Services
331	455	.	CBSS	Compass Bancshares Inc	4010	Banks
332	425	.	CBH	Commerce Bancorp Inc/Nj	4010	Banks
333	982	974	3UALAQ	UAL Corp	2030	Transportation
334	380	429	DTE	Dte Energy Co	5510	Utilities
335	309	336	LEG	Leggett & Platt Inc	2520	Consumer Durables & Apparel
336	506	.	BPOP	Popular Inc	4010	Banks
337	303	509	ESV	Ensco International Inc	1010	Energy
338	532	867	CHS	Chicos Fas Inc	2550	Retailing
339	314	312	PH	Parker-Hannifin Corp	2010	Capital Goods
340	436	616	SII	Smith International Inc	1010	Energy
341	376	.	NCF	National Commerce Financial	4010	Banks
342	291	421	DLTR	Dollar Tree Stores Inc	2550	Retailing
343	570	872	COCO	Corinthian Colleges Inc	2020	Commercial Svcs & Supplies
344	375	635	MUR	Murphy Oil Corp	1010	Energy
345	544	.	NYB	New York Cmnty Bancorp Inc	4010	Banks
346	319	290	VMC	Vulcan Materials Co	1510	Materials
347	673	338	RCNC	RCN Corp	5010	Telecommunication Services
348	462	261	CTL	Centurytel Inc	5010	Telecommunication Services
349	254	.	SPC	St Paul Cos	4030	Insurance
350	563	347	SEPR	Sepracor Inc	3520	Pharmaceuticals & Biotech
351	61	122	DUK	Duke Energy Corp	5510	Utilities
352	141	178	CD	Cendant Corp	2020	Commercial Svcs & Supplies
353	435	385	OSI	Outback Steakhouse Inc	2530	Hotels Restaurants & Leisure
354	430	.	UB	Unionbancal Corp	4010	Banks
355	426	560	NDN	99 Cents Only Stores	2550	Retailing
356	420	416	GNTX	Gentex Corp	2510	Automobiles & Components
357	278	447	OHP	Oxford Health Plans Inc	3510	Health Care Equipment & Svcs
358	674	.	DRL	Doral Financial Corp	4020	Diversified Financials
359	700	917	AMLN	Amylin Pharmaceuticals Inc	3520	Pharmaceuticals & Biotech
360	312	.	MI	Marshall & Ilsley Corp	4010	Banks

361	489	.	BRO	Brown & Brown Inc	4030	Insurance
362	483	.	ASO	Amsouth Bancorporation	4010	Banks
363	385	254	SEE	Sealed Air Corp	1510	Materials
364	837	57	LVLT	Level 3 Commun Inc	5010	Telecommunication Services
365	477	608	DBD	Diebold Inc	4520	Technology Hardware & Equip
366	503	854	EQT	Equitable Resources Inc	5510	Utilities
367	159	.	A	Agilent Technologies Inc	4520	Technology Hardware & Equip
368	360	.	AJG	Gallagher (Arthur J.) & Co	4030	Insurance
369	472	678	JEC	Jacobs Engineering Group Inc	2010	Capital Goods
370	286	432	DRI	Darden Restaurants Inc	2530	Hotels Restaurants & Leisure
371	445	298	VFC	Vf Corp	2520	Consumer Durables & Apparel
372	229	521	NVLS	Novellus Systems Inc	4520	Technology Hardware & Equip
373	704	798	ENDP	Endo Pharmaceuticals Hldgs	3520	Pharmaceuticals & Biotech
374	431	531	ETM	Entercom Communications Corp	2540	Media
375	452	507	FSH	Fisher Scientific Intl Inc	3510	Health Care Equipment & Svcs
376	382	476	LAMR	Lamar Advertising Co -Cl A	2540	Media
377	832	.	JBLU	Jetblue Airways Corp	2030	Transportation
378	611	929	CVH	Coventry Health Care	3510	Health Care Equipment & Svcs
379	579	383	APCC	American Pwr Cnvrsion	2010	Capital Goods
380	457	655	MNI	Mcclatchy Co -Cl A	2540	Media
381	480	486	MDP	Meredith Corp	2540	Media
382	766	961	KMX	Carmax Inc	2550	Retailing
383	268	424	DST	Dst Systems Inc	2020	Commercial Svcs & Supplies
384	646	733	RCII	Rent-A-Center Inc	2550	Retailing
385	429	.	KKD	Krispy Kreme Doughnuts Inc	2530	Hotels Restaurants & Leisure
386	453	422	HSP	Hispanic Broadcasting -Cl A	2540	Media
387	484	650	APH	Amphenol Corp	4520	Technology Hardware & Equip
388	491	652	SCG	Scana Corp	5510	Utilities
389	323	.	TRH	Transatlantic Holdings Inc	4030	Insurance
390	349	.	NEU	Neuberger Berman Inc	4020	Diversified Financials
391	518	861	HAR	Harman International Inds	2520	Consumer Durables & Apparel
392	661	809	CELG	Celgene Corp	3520	Pharmaceuticals & Biotech
393	399	644	FLR	Fluor Corp	2010	Capital Goods
394	631	855	SCIO	Scios Inc	3520	Pharmaceuticals & Biotech
395	556	738	TBL	Timberland Co -Cl A	2520	Consumer Durables & Apparel
396	501	395	GRA	Grace (W R) & Co	1510	Materials
397	416	.	UTSI	Utstarcom Inc	4520	Technology Hardware & Equip
398	508	728	EDMC	Education Management Corp	2020	Commercial Svcs & Supplies
399	310	559	DVN	Devon Energy Corp	1010	Energy
400	583	716	PPP	Pogo Producing Co	1010	Energy
401	369	499	EC	Engelhard Corp	1510	Materials
402	374	.	CEY	Certegy Inc	2020	Commercial Svcs & Supplies
403	555	435	ISCA	Intl Speedway Corp -Cl A	2530	Hotels Restaurants & Leisure
404	163	.	USB	U S Bancorp	4010	Banks
405	586	866	COLM	Columbia Sportswear Co	2520	Consumer Durables & Apparel
406	428	538	BMS	Bemis Co	1510	Materials
407	624	815	FIC	Fair Isaac Corp	4510	Software & Services

408	524	296	RSG	Republic Services Inc	2020	Commercial Svcs & Supplies
409	958	181	AES	AES Corp. (The)	5510	Utilities
410	485	.	EV	Eaton Vance Corp	4020	Diversified Financials
411	713	.	CZN	Citizens Communications Co	5010	Telecommunication Services
412	197	.	JHF	Hancock John Finl Svcs Inc	4030	Insurance
413	581	705	ZBRA	Zebra Technologies Cp -Cl A	4520	Technology Hardware & Equip
414	389	.	TMK	Torchmark Corp	4030	Insurance
415	638	274	MAT	Mattel Inc	2520	Consumer Durables & Apparel
416	564	.	FVB	First Virginia Banks Inc	4010	Banks
417	515	901	SCRI	Sicor Inc	3520	Pharmaceuticals & Biotech
418	471	.	ERIE	Erie Indemnity Co -Cl A	4030	Insurance
419	475	551	VAL	Valspar Corp	1510	Materials
420	347	845	CEPH	Cephalon Inc	3520	Pharmaceuticals & Biotech
421	246	.	AOC	Aon Corp	4030	Insurance
422	785	940	IVX	Ivax Corp	3520	Pharmaceuticals & Biotech
423	412	654	LEN	Lennar Corp	2520	Consumer Durables & Apparel
424	478	645	DCI	Donaldson Co Inc	2010	Capital Goods
425	414	748	ATK	Alliant Techsystems Inc	2010	Capital Goods
426	649	.	NXTP	Nextel Partners Inc	5010	Telecommunication Services
427	362	430	WEN	Wendy'S International Inc	2530	Hotels Restaurants & Leisure
428	406	604	BEC	Beckman Coulter Inc	3510	Health Care Equipment & Svcs
429	539	536	PLL	Pall Corp	2010	Capital Goods
430	548	794	EXBD	Corporate Executive Brd Co	2020	Commercial Svcs & Supplies
431	521	.	BNK	Banknorth Group Inc	4010	Banks
432	.	.	RGC	Regal Entertainment Group	2540	Media
433	281	452	MGG	Mgm Mirage	2530	Hotels Restaurants & Leisure
434	572	704	STR	Questar Corp	5510	Utilities
435	535	772	GTK	Gtech Holdings Corp	2530	Hotels Restaurants & Leisure
436	373	519	FO	Fortune Brands Inc	2520	Consumer Durables & Apparel
437	205	.	CB	Chubb Corp	4030	Insurance
438	750	922	WDC	Western Digital Corp	4520	Technology Hardware & Equip
439	421	769	CAKE	Cheesecake Factory Inc	2530	Hotels Restaurants & Leisure
440	210	155	MAY	May Department Stores Co	2550	Retailing
441	591	.	ENR	Energizer Hldgs Inc	3030	Household & Personal Prods
442	486	523	CNX	Consol Energy Inc	1510	Materials
443	218	208	TSG	Sabre Hldgs Corp -Cl A	2020	Commercial Svcs & Supplies
444	481	462	DV	Devry Inc	2020	Commercial Svcs & Supplies
445	607	535	REV	Revlon Inc -Cl A	3030	Household & Personal Prods
446	527	690	PAX	Paxson Comm Corp -Cl A	2540	Media
447	561	362	DL	Dial Corporation	3030	Household & Personal Prods
448	664	.	MKL	Markel Corp	4030	Insurance
449	500	.	VLY	Valley National Bancorp	4010	Banks
450	575	732	ESI	Itt Educational Svcs Inc	2020	Commercial Svcs & Supplies
451	513	.	PKG	Packaging Corp Of America	1510	Materials
452	495	.	UDI	United Defense Industries	2010	Capital Goods
453	619	888	SRCL	Stericycle Inc	2020	Commercial Svcs & Supplies
454	576	891	ICST	Integrated Circuit Systems	4520	Technology Hardware & Equip

455	469	489	HHS	Harte Hanks Inc	2540	Media
456	351	239	SVM	Servicemaster Co	2020	Commercial Svcs & Supplies
457	466	779	STZ	Constellation Brands -Cl A	3020	Food Beverage & Tobacco
458	354	665	DHI	D R Horton Inc	2520	Consumer Durables & Apparel
459	559	443	SNPS	Synopsys Inc	4510	Software & Services
460	463	202	NSC	Norfolk Southern Corp	2030	Transportation
461	620	450	ICOS	Icos Corp	3520	Pharmaceuticals & Biotech
462	473	597	NATI	National Instruments Corp	4510	Software & Services
463	786	.	CFFN	Capitol Federal Financial	4010	Banks
464	460	.	AAP	Advance Auto Parts	2550	Retailing
465	313	345	JNY	Jones Apparel Group Inc	2520	Consumer Durables & Apparel
466	626	.	STU	Student Loan Corp	4020	Diversified Financials
467	424	396	VCI	Valassis Communications Inc	2020	Commercial Svcs & Supplies
468	574	.	CF	Charter One Finl Inc	4010	Banks
469	409	339	CAL	Continental Airls Inc -Cl B	2030	Transportation
470	219	715	NVDA	Nvidia Corp	4520	Technology Hardware & Equip
471	777	783	ADTN	Adtran Inc	4520	Technology Hardware & Equip
472	440	611	MAN	Manpower Inc/Wi	2020	Commercial Svcs & Supplies
473	651	.	BER	Berkley (W R) Corp	4030	Insurance
474	774	.	FNF	Fidelity National Finl Inc	4030	Insurance
475	448	.	IFIN	Investors Financial Svcs Cp	4020	Diversified Financials
476	569	801	MRX	Medicis Pharmaceut Cp -Cl A	3520	Pharmaceuticals & Biotech
477	531	547	JW.A	Wiley (John) & Sons -Cl A	2540	Media
478	441	598	UHS	Universal Health Svcs -Cl B	3510	Health Care Equipment & Svcs
479	446	565	CXR	Cox Radio Inc -Cl A	2540	Media
480	588	789	APPB	Applebees Intl Inc	2530	Hotels Restaurants & Leisure
481	596	803	PETM	Petsmart Inc	2550	Retailing
482	329	603	MHK	Mohawk Industries Inc	2520	Consumer Durables & Apparel
483	507	722	REY	Reynolds & Reynolds -Cl A	2020	Commercial Svcs & Supplies
484	546	702	HLR	Hollinger Intl Inc -Cl A	2540	Media
485	545	600	LEE	Lee Enterprises	2540	Media
486	540	818	PHM	Pulte Homes Inc	2520	Consumer Durables & Apparel
487	487	723	TLB	Talbots Inc	2550	Retailing
488	729	862	UGI	Ugi Corp	5510	Utilities
489	454	836	PIR	Pier 1 Imports Inc/De	2550	Retailing
490	567	679	PSC	Philadelphia Suburban Corp	5510	Utilities
491	290	587	BSG	Bisys Group Inc	2020	Commercial Svcs & Supplies
492	577	578	MIL	Millipore Corp	3510	Health Care Equipment & Svcs
493	236	.	JNS	Janus Capital Group Inc	4020	Diversified Financials
494	537	.	ADS	Alliance Data Systems Corp	2020	Commercial Svcs & Supplies
495	144	.	COF	Capital One Finl Corp	4020	Diversified Financials
496	520	726	HSIC	Schein Henry Inc	3510	Health Care Equipment & Svcs
497	670	774	STN	Station Casinos Inc	2530	Hotels Restaurants & Leisure
498	689	.	HBAN	Huntington Bancshares	4010	Banks
499	629	.	FULT	Fulton Financial Corp	4010	Banks
500	730	609	LYO	Lyondell Chemical Co	1510	Materials
501	602	913	PETC	Petco Animal Supplies Inc	2550	Retailing

502	592	541	HNI	Hon Industries	2020	Commercial Svcs & Supplies
503	635	643	LANC	Lancaster Colony Corp	3020	Food Beverage & Tobacco
504	434	899	MIK	Michaels Stores Inc	2550	Retailing
505	542	.	WL	Wilmington Trust Corp	4010	Banks
506	566	.	CBSH	Commerce Bancshares Inc	4010	Banks
507	552	681	RCI	Renal Care Group Inc	3510	Health Care Equipment & Svcs
508	703	780	ATG	Agl Resources Inc	5510	Utilities
509	650	.	AMTD	Ameritrade Holding Corp	4020	Diversified Financials
510	676	686	CHK	Chesapeake Energy Corp	1010	Energy
511	458	.	MRBK	Mercantile Bankshares Corp	4010	Banks
512	87	70	SWY	Safeway Inc	3010	Food & Drug Retailing
513	728	767	SMG	Scotts Co	1510	Materials
514	534	.	MCY	Mercury General Corp	4030	Insurance
515	405	471	WHR	Whirlpool Corp	2520	Consumer Durables & Apparel
516	816	814	SNDK	Sandisk Corp	4520	Technology Hardware & Equip
517	525	823	WSTC	West Corp	2020	Commercial Svcs & Supplies
518	568	596	ORLY	O Reilly Automotive Inc	2550	Retailing
519	736	.	LUK	Leucadia National Corp	4020	Diversified Financials
520	778	788	STK	Storage Technology Cp	4520	Technology Hardware & Equip
521	585	402	HUB.B	Hubbell Inc -Cl B	2010	Capital Goods
522	468	483	RL	Polo Ralph Lauren Cp -Cl A	2520	Consumer Durables & Apparel
523	573	612	MEG	Media General -Cl A	2540	Media
524	242	.	LNC	Lincoln National Corp	4030	Insurance
525	781	.	GPT	Greenpoint Financial Corp	4010	Banks
526	533	701	RDC	Rowan Cos Inc	1010	Energy
527	666	683	CHD	Church & Dwight Inc	3030	Household & Personal Prods
528	512	520	MLHR	Miller (Herman) Inc	2020	Commercial Svcs & Supplies
529	636	727	MDU	Mdu Resources Group Inc	5510	Utilities
530	735	984	KSE	Keyspan Corp	5510	Utilities
531	550	.	CYN	City National Corp	4010	Banks
532	706	590	VHI	Valhi Inc	1510	Materials
533	488	633	ALE	Allete Inc	2010	Capital Goods
534	403	.	BE	Bearingpoint Inc	4510	Software & Services
535	639	629	NFG	National Fuel Gas Co	5510	Utilities
536	608	753	SFD	Smithfield Foods Inc	3020	Food Beverage & Tobacco
537	377	333	NUE	Nucor Corp	1510	Materials
538	711	321	WWCA	Western Wireless Corp -Cl A	5010	Telecommunication Services
539	595	571	BLC	Belo Corp -Ser A Com	2540	Media
540	748	671	PSUN	Pacific Sunwear Calif Inc	2550	Retailing
541	543	529	CEG	Constellation Energy Grp Inc	5510	Utilities
542	644	530	WEC	Wisconsin Energy Corp	5510	Utilities
543	764	.	SAFC	Safeco Corp	4030	Insurance
544	623	856	PFGC	Performance Food Group Co	3010	Food & Drug Retailing
545	439	878	HNT	Health Net Inc - Cl A	3510	Health Care Equipment & Svcs
546	562	544	NBL	Noble Energy Inc	1010	Energy
547	605	570	CBT	Cabot Corp	1510	Materials
548	686	341	BR	Burlington Resources Inc	1010	Energy

549	755	751	WERN	Werner Enterprises Inc	2030	Transportation
550	652	737	GYI	Getty Images Inc	2540	Media
551	648	787	CBRL	Cbrl Group Inc	2530	Hotels Restaurants & Leisure
552	773	793	JBHT	Hunt (Jb) Transprt Svcs Inc	2030	Transportation
553	731	668	GXP	Great Plains Energy Inc	5510	Utilities
554	716	.	EW	Edwards Lifesciences Corp	3510	Health Care Equipment & Svcs
555	610	.	CRL	Charles River Labs Intl Inc	3520	Pharmaceuticals & Biotech
556	618	606	OCR	Omnicare Inc	3510	Health Care Equipment & Svcs
557	797	240	ROK	Rockwell Automation	2010	Capital Goods
558	744	810	ARG	Airgas Inc	1510	Materials
559	482	482	SON	Sonoco Products Co	1510	Materials
560	612	618	NFX	Newfield Exploration Co	1010	Energy
561	621	619	NST	Nstar	5510	Utilities
562	625	744	IDC	Interactive Data Corp	2540	Media
563	391	502	DPL	Dpl Inc	5510	Utilities
564	498	457	SFA	Scientific-Atlanta Inc	4520	Technology Hardware & Equip
565	465	297	JWN	Nordstrom Inc	2550	Retailing
566	616	591	SWFT	Swift Transportation Co Inc	2030	Transportation
567	530	638	HLYW	Hollywood Entmt Corp	2550	Retailing
568	514	782	RI	Ruby Tuesday Inc	2530	Hotels Restaurants & Leisure
569	511	850	ELX	Emulex Corp	4520	Technology Hardware & Equip
570	609	.	XJT	Expressjet Holdings Inc	2030	Transportation
571	614	664	MTD	Mettler-Toledo Intl Inc	4520	Technology Hardware & Equip
572	758	567	CSL	Carlisle Cos Inc	2010	Capital Goods
573	690	653	JDEC	Edwards J D & Co	4510	Software & Services
574	654	.	FTI	Fmc Technologies Inc	1010	Energy
575	668	800	VVC	Vectren Corp	5510	Utilities
576	324	433	CVG	Convergys Corp	2020	Commercial Svcs & Supplies
577	779	.	BOH	Bank Of Hawaii Corp	4010	Banks
578	763	.	MCCC	Mediacom Communications Corp	2540	Media
579	547	736	CAM	Cooper Cameron Corp	1010	Energy
580	427	.	ZION	Zions Bancorporation	4010	Banks
581	681	.	CFR	Cullen/Frost Bankers Inc	4010	Banks
582	493	463	CTX	Centex Corp	2520	Consumer Durables & Apparel
583	557	.	GRP	Grant Prideco Inc	1010	Energy
584	687	834	PPDI	Pharmaceutical Prod Dev Inc	3510	Health Care Equipment & Svcs
585	683	764	AME	Ametek Inc	2010	Capital Goods
586	770	505	CLE	Claires Stores Inc	2550	Retailing
587	918	406	CKFR	Checkfree Corp	2020	Commercial Svcs & Supplies
588	630	898	RYL	Ryland Group Inc	2520	Consumer Durables & Apparel
589	633	680	HSC	Harsco Corp	2010	Capital Goods
590	672	943	KEG	Key Energy Services Inc	1010	Energy
591	283	.	MTG	Mgic Investment Corp/Wi	4030	Insurance
592	289	481	CDN	Cadence Design Sys Inc	4510	Software & Services
593	662	.	HCC	Hcc Ins Hldgs Inc	4030	Insurance
594	720	731	PNY	Piedmont Natural Gas Co	5510	Utilities

595	688	.	HIB	Hibernia Corp -Cl A	4010	Banks
596	597	694	ADSK	Autodesk Inc	4510	Software & Services
597	701	953	WGR	Western Gas Resources Inc	1010	Energy
598	479	390	AOT	Apogent Technologies Inc	3510	Health Care Equipment & Svcs
599	658	658	LZ	Lubrizol Corp	1510	Materials
600	882	777	WR	Westar Energy Inc	5510	Utilities
601	504	835	TOL	Toll Brothers Inc	2520	Consumer Durables & Apparel
602	476	409	KMG	Kerr-Mcgee Corp	1010	Energy
603	528	461	AEOS	Amern Eagle Outfitters Inc	2550	Retailing
604	772	925	HOV	Hovnanian Entrprs Inc -Cl A	2520	Consumer Durables & Apparel
605	600	709	KBH	Kb Home	2520	Consumer Durables & Apparel
606	768	831	SJM	Smucker (Jm) Co	3020	Food Beverage & Tobacco
607	617	871	VRC	Varco International Inc	1010	Energy
608	718	674	RPM	Rpm International Inc	1510	Materials
609	637	.	ONNN	On Semiconductor Corp	4520	Technology Hardware & Equip
610	339	228	MYG	Maytag Corp	2520	Consumer Durables & Apparel
611	738	696	PGL	Peoples Energy Corp	5510	Utilities
612	496	684	MBG	Mandalay Resort Group	2530	Hotels Restaurants & Leisure
613	137	285	SEBL	Siebel Systems Inc	4510	Software & Services
614	788	129	NWL	Newell Rubbermaid Inc	2520	Consumer Durables & Apparel
615	678	880	NBTY	Nbty Inc	3030	Household & Personal Prods
616	694	177	BNI	Burlington Northern Santa Fe	2030	Transportation
617	714	697	ALB	Albemarle Corp	1510	Materials
618	659	691	AHG	Apria Healthcare Group	3510	Health Care Equipment & Svcs
619	737	318	CYCL	Centennial Commun Cp -Cl A	5010	Telecommunication Services
620	294	323	PCG	Pg&E Corp	5510	Utilities
621	517	552	TFX	Teleflex Inc	2010	Capital Goods
622	726	.	BOKF	Bok Financial Corp	4010	Banks
623	708	868	GREY	Grey Global Group Inc	2540	Media
624	671	934	TEK	Tektronix Inc	4520	Technology Hardware & Equip
625	395	369	DO	Diamond Offshre Drilling Inc	1010	Energy
626	835	824	SBGI	Sinclair Broadcast Gp -Cl A	2540	Media
627	697	712	ATR	Aptargroup Inc	1510	Materials
628	752	932	AGI	Alliance Gaming Corp	2530	Hotels Restaurants & Leisure
629	396	.	NCC	National City Corp	4010	Banks
630	696	714	RGS	Regis Corp/Mn	2550	Retailing
631	803	863	EGN	Energen Corp	5510	Utilities
632	888	742	SIRI	Sirius Satellite Radio Inc	2540	Media
633	685	670	BTH	Blyth Inc	2520	Consumer Durables & Apparel
634	754	799	STE	Steris Corp	3510	Health Care Equipment & Svcs
635	771	747	WGL	Wgl Holdings Inc	5510	Utilities
636	749	676	CYT	Cytec Industries Inc	1510	Materials
637	742	830	WPS	Wps Resources Corp	5510	Utilities
638	817	980	PXD	Pioneer Natural Resources Co	1010	Energy
639	669	828	MDC	Mdc Holdings Inc	2520	Consumer Durables & Apparel
640	692	.	BSC	Bear Stearns Companies Inc	4020	Diversified Financials
641	474	85	CA	Computer Associates Intl Inc	4510	Software & Services

642	767	906	TKR	Timken Co	2010	Capital Goods
643	634	410	NI	Nisource Inc	5510	Utilities
644	784	.	PCO	Premcor Inc	1010	Energy
645	759	487	SE	7-Eleven Inc	3010	Food & Drug Retailing
646	587	513	PNR	Pentair Inc	2010	Capital Goods
647	215	.	BRCD	Brocade Communications Sys	4520	Technology Hardware & Equip
648	632	357	SSCC	Smurfit-Stone Container Corp	1510	Materials
649	820	265	HAS	Hasbro Inc	2520	Consumer Durables & Apparel
650	795	894	RBK	Reebok International Ltd	2520	Consumer Durables & Apparel
651	747	785	WCN	Waste Connections Inc	2020	Commercial Svcs & Supplies
652	300	.	MBI	Mbia Inc	4030	Insurance
653	551	792	SCHL	Scholastic Corp	2540	Media
654	613	649	RKY	Coors (Adolph) -Cl B	3020	Food Beverage & Tobacco
655	796	775	ATO	Atmos Energy Corp	5510	Utilities
656	208	642	KG	King Pharmaceuticals Inc	3520	Pharmaceuticals & Biotech
657	840	.	PBCT	Peoples Bank Bridgeport Ct	4010	Banks
658	677	626	OGE	Oge Energy Corp	5510	Utilities
659	397	685	AMKR	Amkor Technology Inc	4520	Technology Hardware & Equip
660	745	.	PL	Protective Life Corp	4030	Insurance
661	418	.	AGE	Edwards (A G) Inc	4020	Diversified Financials
662	741	920	BYD	Boyd Gaming Corp	2530	Hotels Restaurants & Leisure
663	792	660	PSD	Puget Energy Inc	5510	Utilities
664	606	752	AXL	American Axle & Mfg Hldgs	2510	Automobiles & Components
665	894	.	XMSR	Xm Satellite Radio Hldgs Inc	2540	Media
666	809	549	BGG	Briggs & Stratton	2010	Capital Goods
667	599	384	BDK	Black & Decker Corp	2520	Consumer Durables & Apparel
668	722	740	SXT	Sensient Technologies Corp	3020	Food Beverage & Tobacco
669	815	.	SEM	Select Medical Corp	3510	Health Care Equipment & Svcs
670	906	405	PRM	Primedia Inc	2540	Media
671	852	.	FAF	First American Corp/Ca	4030	Insurance
672	560	661	CMH	Clayton Homes Inc	2520	Consumer Durables & Apparel
673	857	981	OLN	Olin Corp	1510	Materials
674	762	858	CMLS	Cumulus Media Inc	2540	Media
675	775	.	ASBC	Associated Banc Corp	4010	Banks
676	808	768	COKE	Coca-Cola Btlng Cons	3020	Food Beverage & Tobacco
677	791	826	BKH	Black Hills Corp	5510	Utilities
678	598	707	LZB	La-Z-Boy Inc	2520	Consumer Durables & Apparel
679	812	.	BTU	Peabody Energy Corp	1510	Materials
680	655	933	NOI	National-Oilwell Inc	1010	Energy
681	721	849	HE	Hawaiian Electric Inds	5510	Utilities
682	693	595	ZLC	Zale Corp	2550	Retailing
683	398	914	LRCX	Lam Research Corp	4520	Technology Hardware & Equip
684	780	746	WOR	Worthington Industries	1510	Materials
685	757	632	SNA	Snap-On Inc	2520	Consumer Durables & Apparel
686	739	820	RYN	Rayonier Inc	1510	Materials
687	383	251	MRO	Marathon Oil Corp	1010	Energy
688	695	440	HTV	Hearst-Argyle Television	2540	Media

689	578	455	HCR	Manor Care Inc	3510	Health Care Equipment & Svcs
690	675	539	CR	Crane Co	2010	Capital Goods
691	582	659	GAS	Nicor Inc	5510	Utilities
692	725	545	CK	Crompton Corp	1510	Materials
693	364	503	SWK	Stanley Works	2520	Consumer Durables & Apparel
694	765	.	TPC	Triton Pcs Hldgs Inc	5010	Telecommunication Services
695	727	816	SLGN	Silgan Holdings Inc	1510	Materials
696	843	897	ROAD	Roadway Corp	2030	Transportation
697	761	700	GET	Gaylord Entertainment	2530	Hotels Restaurants & Leisure
698	724	797	NMG.A	Neiman-Marcus Group Inc	2550	Retailing
699	499	.	CYH	Community Health Systems Inc	3510	Health Care Equipment & Svcs
700	443	375	DNY	Donnelley (R R) & Sons Co	2020	Commercial Svcs & Supplies
701	509	.	UTR	Unitrin Inc	4030	Insurance
702	.	.	TVL	Lin Tv Corp	2540	Media
703	679	400	MLM	Martin Marietta Materials	1510	Materials
704	710	639	PSS	Payless Shoesource Inc	2550	Retailing
705	698	945	PDE	Pride International Inc	1010	Energy
706	641	.	ROIAK	Radio One Inc	2540	Media
707	682	881	AGY	Argosy Gaming Corp	2530	Hotels Restaurants & Leisure
708	793	.	SKYF	Sky Financial Group Inc	4010	Banks
709	422	624	AVX	Avx Corp	4520	Technology Hardware & Equip
710	790	725	FOE	Ferro Corp	1510	Materials
711	667	419	NAV	Navistar Internationl	2010	Capital Goods
712	789	478	DQE	Dqe Inc	5510	Utilities
713	801	358	BOL	Bausch & Lomb Inc	3510	Health Care Equipment & Svcs
714	855	.	WRC	Westport Resources Corp	1010	Energy
715	743	215	KSU	Kansas City Southern	2030	Transportation
716	66	80	EDS	Electronic Data Systems Corp	4510	Software & Services
717	419	918	IRF	Intl Rectifier Corp	4520	Technology Hardware & Equip
718	707	.	ORI	Old Republic Intl Corp	4030	Insurance
719	571	426	EMN	Eastman Chemical Co	1510	Materials
720	356	971	NSM	National Semiconductor Corp	4520	Technology Hardware & Equip
721	753	743	EMMS	Emmis Communictns Cp -Cl A	2540	Media
722	805	875	UVV	Universal Corp/Va	3020	Food Beverage & Tobacco
723	647	466	POM	Pepco Holdings Inc	5510	Utilities
724	594	284	WIN	Winn-Dixie Stores Inc	3010	Food & Drug Retailing
725	858	741	BWA	Borg Warner Inc	2510	Automobiles & Components
726	494	.	RDN	Radian Group Inc	4030	Insurance
727	699	720	HRS	Harris Corp	4520	Technology Hardware & Equip
728	822	534	CNF	Cnf Inc	2030	Transportation
729	645	479	LIN	Linens N Things Inc	2550	Retailing
730	549	.	PMI	Pmi Group Inc	4030	Insurance
731	884	.	RF	Regions Finl Corp	4010	Banks
732	523	354	RDA	Readers Digest Assn	2540	Media
733	367	473	BJ	Bjs Wholesale Club Inc	2550	Retailing
734	868	919	JAS.A	Jo-Ann Stores Inc -Cl A	2550	Retailing
735	320	569	SPW	Spx Corp	2010	Capital Goods

736	717	778	GPI	Group 1 Automotive Inc	2550	Retailing
737	807	902	SPF	Standard Pacific Cp	2520	Consumer Durables & Apparel
738	776	669	ANN	Anntaylor Stores Corp	2550	Retailing
739	838	380	SBL	Symbol Technologies	4520	Technology Hardware & Equip
740	819	695	CAO	Csk Auto Corp	2550	Retailing
741	733	829	CNL	Cleco Corp	5510	Utilities
742	800	588	BOW	Bowater Inc	1510	Materials
743	628	.	FMER	Firstmerit Corp	4010	Banks
744	296	500	TDS	Telephone & Data	5010	Telecommunication Services
745	305	525	XEL	Xcel Energy Inc	5510	Utilities
746	914	364	HPC	Hercules Inc	1510	Materials
747	898	.	LII	Lennox International Inc	2010	Capital Goods
748	851	628	ABF	Airborne Inc	2030	Transportation
749	760	754	IDA	Idacorp Inc	5510	Utilities
750	282	368	TER	Teradyne Inc	4520	Technology Hardware & Equip
751	467	.	ISIL	Intersil Corp -Cl A	4520	Technology Hardware & Equip
752	846	804	SUG	Southern Union Co	5510	Utilities
753	828	955	ACI	Arch Coal Inc	1510	Materials
754	902	378	RAD	Rite Aid Corp	3010	Food & Drug Retailing
755	830	472	GLK	Great Lakes Chemical Corp	1510	Materials
756	818	885	WSC	Wesco Financial Corp	2020	Commercial Svcs & Supplies
757	863	.	WBS	Webster Financial Corp	4010	Banks
758	799	923	BZH	Beazer Homes Usa Inc	2520	Consumer Durables & Apparel
759	806	504	ACXM	Acxiom Corp	4510	Software & Services
760	732	837	PCP	Precision Castparts Corp	2010	Capital Goods
761	841	948	KMT	Kennametal Inc	2010	Capital Goods
762	833	847	MXO	Maxtor Corp	4520	Technology Hardware & Equip
763	869	964	OKE	Oneok Inc	5510	Utilities
764	834	889	IPX	Interpool Inc	2020	Commercial Svcs & Supplies
765	842	795	SWX	Southwest Gas Corp	5510	Utilities
766	827	965	TMO	Thermo Electron Corp	4520	Technology Hardware & Equip
767	867	841	ATAH	Ata Holdings Corp	2030	Transportation
768	823	909	ISLE	Isle Of Capri Casinos Inc	2530	Hotels Restaurants & Leisure
769	896	938	BWS	Brown Shoe Inc	2520	Consumer Durables & Apparel
770	590	446	BKS	Barnes & Noble Inc	2550	Retailing
771	769	825	FST	Forest Oil Corp	1010	Energy
772	848	821	AEN	Amc Entertainment Inc	2540	Media
773	660	689	LNT	Alliant Energy Corp	5510	Utilities
774	656	607	IBC	Interstate Bakeries Cp	3020	Food Beverage & Tobacco
775	864	.	ICCI	Insight Communications Inc	2540	Media
776	734	882	ESA	Extended Stay America Inc	2530	Hotels Restaurants & Leisure
777	829	985	AG	Agco Corp	2010	Capital Goods
778	740	977	DVA	Davita Inc	3510	Health Care Equipment & Svcs
779	847	844	PCH	Potlatch Corp	1510	Materials
780	558	593	ARM	Arvinmeritor Inc	2510	Automobiles & Components
781	831	.	MEE	Massey Energy Co	1510	Materials
782	892	912	PCU	Southern Peru Copper	1510	Materials

783	665	515	TIN	Temple-Inland Inc	1510	Materials
784	277	.	CMA	Comerica Inc.	4010	Banks
785	746	893	VLO	Valero Energy Corp	1010	Energy
786	870	873	R	Ryder System Inc	2030	Transportation
787	861	819	VPI	Vintage Petroleum Inc	1010	Energy
788	519	582	AN	Autonation Inc	2550	Retailing
789	622	857	TDW	Tidewater Inc	1010	Energy
790	871	692	PZB	Pittston Co	2020	Commercial Svcs & Supplies
791	709	663	JBX	Jack In The Box Inc	2530	Hotels Restaurants & Leisure
792	663	.	WCI	Wci Communities Inc	2520	Consumer Durables & Apparel
793	813	647	BCC	Boise Cascade Corp	1510	Materials
794	927	326	WPI	Watson Pharmaceuticals Inc	3520	Pharmaceuticals & Biotech
795	877	924	CNJ	Cole National Corp	2550	Retailing
796	897	577	SUN	Sunoco Inc	1010	Energy
797	715	883	BGP	Borders Group Inc	2550	Retailing
798	444	.	FCS	Fairchild Semiconductor Intl	4520	Technology Hardware & Equip
799	891	161	BMC	Bmc Software Inc	4510	Software & Services
800	811	.	AF	Astoria Finl Corp	4010	Banks
801	702	518	LEA	Lear Corp	2510	Automobiles & Components
802	589	887	TTN	Titan Corp	4510	Software & Services
803	878	846	IVGN	Invitrogen Corp	3520	Pharmaceuticals & Biotech
804	810	389	IM	Ingram Micro Inc -Cl A	4520	Technology Hardware & Equip
805	856	585	PKI	Perkinelmer Inc	4520	Technology Hardware & Equip
806	798	363	ATI	Allegheny Technologies Inc	1510	Materials
807	825	.	ABG	Asbury Automotive Group Inc	2550	Retailing
808	844	710	TEX	Terex Corp	2010	Capital Goods
809	845	954	UAG	United Auto Group Inc	2550	Retailing
810	604	892	SAH	Sonic Automotive Inc -Cl A	2550	Retailing
811	824	944	CHRS	Charming Shoppes	2550	Retailing
812	584	.	KEY	Keycorp	4010	Banks
813	874	990	GHVI	Genesis Health Ventures Inc	3510	Health Care Equipment & Svcs
814	794	759	BC	Brunswick Corp	2520	Consumer Durables & Apparel
815	883	886	AVA	Avista Corp	5510	Utilities
816	723	666	CTB	Cooper Tire & Rubber	2510	Automobiles & Components
817	653	634	LAF	Lafarge North America Inc	1510	Materials
818	890	808	ALK	Alaska Air Group Inc	2030	Transportation
819	684	.	UPC	Union Planters Corp	4010	Banks
820	502	839	TECD	Tech Data Corp	4520	Technology Hardware & Equip
821	802	557	EAS	Energy East Corp	5510	Utilities
822	895	966	OSG	Overseas Shipholding Group	1010	Energy
823	642	852	FLS	Flowserve Corp	2010	Capital Goods
824	849	876	URS	Urs Corp	2010	Capital Goods
825	893	928	CPO	Corn Products Intl Inc	3020	Food Beverage & Tobacco
826	885	.	UCO	Universal Compression Hldgs	1010	Energy
827	860	805	NOR	Northwestern Corp	5510	Utilities
828	854	376	SOI	Solutia Inc	1510	Materials
829	756	706	PNW	Pinnacle West Capital	5510	Utilities

830	826	907	PBY	Pep Boys-Manny Moe & Jack	2550	Retailing
831	909	842	DRRA	Dura Automotive Sys -Cl B	2510	Automobiles & Components
832	327	160	DPH	Delphi Corp	2510	Automobiles & Components
833	787	572	SCS	Steelcase Inc	2020	Commercial Svcs & Supplies
834	627	219	IP	Intl Paper Co	1510	Materials
835	411	411	ADM	Archer-Daniels-Midland Co	3020	Food Beverage & Tobacco
836	933	.	TWTC	Time Warner Telecom Inc	5010	Telecommunication Services
837	836	784	POL	Polyone Corp	1510	Materials
838	712	860	CKC	Collins & Aikman Corp	2510	Automobiles & Components
839	875	648	TNB	Thomas & Betts Corp	2010	Capital Goods
840	456	580	SVU	Supervalu Inc	3010	Food & Drug Retailing
841	917	976	UNS	Unisource Energy Corp	5510	Utilities
842	529	773	CY	Cypress Semiconductor Corp	4520	Technology Hardware & Equip
843	910	950	DTG	Dollar Thrifty Automotive Gp	2030	Transportation
844	922	349	USG	Usg Corp	2010	Capital Goods
845	900	963	ARW	Arrow Electronics Inc	4520	Technology Hardware & Equip
846	915	927	OMX	Officemax Inc	2550	Retailing
847	615	300	CEN	Ceridian Corp	2020	Commercial Svcs & Supplies
848	311	275	AAPL	Apple Computer Inc	4520	Technology Hardware & Equip
849	170	.	HIG	Hartford Finl Svcs Grp Inc	4030	Insurance
850	923	766	ALO	Alpharma Inc -Cl A	3520	Pharmaceuticals & Biotech
851	580	.	TRI	Triad Hospitals Inc	3510	Health Care Equipment & Svcs
852	866	721	PAS	Pepsiamericas Inc	3020	Food Beverage & Tobacco
853	862	749	YRK	York Intl	2010	Capital Goods
854	919	949	NC	Nacco Industries -Cl A	2010	Capital Goods
855	872	813	BFT	Bally Total Fitness Hldg Cp	2530	Hotels Restaurants & Leisure
856	912	.	AV	Avaya Inc	4520	Technology Hardware & Equip
857	505	735	OMG	Om Group Inc	1510	Materials
858	908	621	LPX	Louisiana-Pacific Corp	1510	Materials
859	928	.	SOV	Sovereign Bancorp Inc	4010	Banks
860	907	915	UHAL	Amerco	2030	Transportation
861	408	209	CSC	Computer Sciences Corp	4510	Software & Services
862	680	951	MGM	Metro Goldwyn Mayer Inc	2540	Media
863	889	939	TSO	Tesoro Petroleum Corp	1010	Energy
864	643	174	CPWR	Compuware Corp	4510	Software & Services
865	987	673	AET	Aetna Inc	3510	Health Care Equipment & Svcs
866	850	935	NU	Northeast Utilities	5510	Utilities
867	925	982	PNM	Pnm Resources Inc	5510	Utilities
868	920	851	AM	American Greetings -Cl A	2520	Consumer Durables & Apparel
869	880	960	CQB	Chiquita Brands Intl	3020	Food Beverage & Tobacco
870	887	602	CPC	Central Parking Corp	2020	Commercial Svcs & Supplies
871	944	272	CMVT	Comverse Technology Inc	4520	Technology Hardware & Equip
872	873	657	ASH	Ashland Inc	1010	Energy
873	905	904	GAP	Great Atlantic & Pac Tea Co	3010	Food & Drug Retailing
874	924	903	CUM	Cummins Inc	2010	Capital Goods
875	984	171	HAL	Halliburton Co	1010	Energy
876	657	942	VSH	Vishay Intrtechnology	4520	Technology Hardware & Equip

877	433	516	TE	Teco Energy Inc	5510	Utilities
878	935	.	ANAT	American National Insurance	4030	Insurance
879	940	996	AWGI	Alderwoods Group Inc	3510	Health Care Equipment & Svcs
880	804	877	HUM	Humana Inc	3510	Health Care Equipment & Svcs
881	839	386	SPOT	Panamsat Corp	2540	Media
882	904	975	BEV	Beverly Enterprises	3510	Health Care Equipment & Svcs
883	911	757	TWR	Tower Automotive Inc	2510	Automobiles & Components
884	879	554	NCR	Ncr Corp	4520	Technology Hardware & Equip
885	691	414	USM	Us Cellular Corp	5010	Telecommunication Services
886	931	581	STEI	Stewart Enterprises -Cl A	3510	Health Care Equipment & Svcs
887	308	556	MLNM	Millennium Pharmactcls Inc	3520	Pharmaceuticals & Biotech
888	946	763	SRP	Sierra Pacific Resources	5510	Utilities
889	949	566	TEN	Tenneco Automotive Inc	2510	Automobiles & Components
890	865	908	AVT	Avnet Inc	4520	Technology Hardware & Equip
891	947	474	CCI	Crown Castle Intl Corp	5010	Telecommunication Services
892	966	398	AMT	American Tower Corp	5010	Telecommunication Services
893	853	637	DLM	Del Monte Foods Co	3020	Food Beverage & Tobacco
894	407	165	TXT	Textron Inc	2010	Capital Goods
895	988	231	GMST	Gemstar-Tv Guide Intl Inc	2540	Media
896	253	970	NOC	Northrop Grumman Corp	2010	Capital Goods
897	333	561	TMPW	Tmp Worldwide Inc	2020	Commercial Svcs & Supplies
898	859	490	URI	United Rentals Inc	2550	Retailing
899	899	865	IKN	Ikon Office Solutions	4520	Technology Hardware & Equip
900	886	555	PKS	Six Flags Inc	2530	Hotels Restaurants & Leisure
901	962	279	DAL	Delta Air Lines Inc	2030	Transportation
902	952	583	ALV	Autoliv Inc	2510	Automobiles & Components
903	553	310	EIX	Edison International	5510	Utilities
904	916	811	FMC	Fmc Corp	1510	Materials
905	913	328	CSX	CSX Corp	2030	Transportation
906	415	630	ATML	Atmel Corp	4520	Technology Hardware & Equip
907	510	277	ODP	Office Depot Inc	2550	Retailing
908	953	992	WLT	Walter Industries Inc	2010	Capital Goods
909	932	995	FL	Foot Locker Inc	2550	Retailing
910	929	969	PPE	Park Place Entmt Corp	2530	Hotels Restaurants & Leisure
911	942	492	BLI	Big Lots Inc	2550	Retailing
912	705	417	TSN	Tyson Foods Inc -Cl A	3020	Food Beverage & Tobacco
913	903	614	ILA	Aquila Inc	5510	Utilities
914	950	991	AMD	Advanced Micro Devices	4520	Technology Hardware & Equip
915	977	.	PVN	Providian Financial Corp	4020	Diversified Financials
916	945	930	DDS	Dillards Inc -Cl A	2550	Retailing
917	934	442	SKS	Saks Inc	2550	Retailing
918	937	79	TLAB	Tellabs Inc	4520	Technology Hardware & Equip
919	386	172	BRCM	Broadcom Corp -Cl A	4520	Technology Hardware & Equip
920	930	761	AKS	Ak Steel Holding Corp	1510	Materials
921	979	315	AMR	AMR Corp/De	2030	Transportation
922	193	146	IPG	Interpublic Group Of Cos	2540	Media
923	497	260	CC	Circuit City Stores Inc	2550	Retailing

924	969	968	X	United States Steel Corp	1510	Materials
925	938	627	AW	Allied Waste Inds Inc	2020	Commercial Svcs & Supplies
926	901	235	BRW	Broadwing Inc	5010	Telecommunication Services
927	88	42	F	Ford Motor Co	2510	Automobiles & Components
928	967	946	CCK	Crown Holdings Inc	1510	Materials
929	948	994	3FLMIQ	Fleming Companies Inc	3010	Food & Drug Retailing
930	601	342	LSI	Lsi Logic Corp	4520	Technology Hardware & Equip
931	603	.	AGR.A	Agere Systems Inc	4520	Technology Hardware & Equip
932	358	137	CVS	Cvs Corp	3010	Food & Drug Retailing
933	321	730	MWV	Meadwestvaco Corp	1510	Materials
934	968	233	UIS	Unisys Corp	4510	Software & Services
935	959	353	QTRN	Quintiles Transnational Corp	3510	Health Care Equipment & Svcs
936	536	130	RTN	Raytheon Co	2010	Capital Goods
937	939	699	PD	Phelps Dodge Corp	1510	Materials
938	941	464	CMS	Cms Energy Corp	5510	Utilities
939	963	399	SRV	Service Corp International	3510	Health Care Equipment & Svcs
940	821	622	CPN	Calpine Corp	5510	Utilities
941	970	997	WBR	Wyndham Intl Inc	2530	Hotels Restaurants & Leisure
942	195	105	KR	Kroger Co	3010	Food & Drug Retailing
943	783	258	GP	Georgia-Pacific Corp	1510	Materials
944	961	420	CIEN	Ciena Corp	4520	Technology Hardware & Equip
945	640	488	AHC	Amerada Hess Corp	1010	Energy
946	957	508	OI	Owens-Illinois Inc	1510	Materials
947	964	989	IGL	IMC Global Inc	1510	Materials
948	199	191	MU	Micron Technology Inc	4520	Technology Hardware & Equip
949	94	41	SUNW	Sun Microsystems Inc	4520	Technology Hardware & Equip
950	951	.	MON	Monsanto Co	1510	Materials
951	955	771	GR	Goodrich Corp	2010	Capital Goods
952	926	337	FD	Federated Dept Stores	2550	Retailing
953	936	331	DCN	Dana Corp	2510	Automobiles & Components
954	943	543	TOY	Toys R Us Inc	2550	Retailing
955	974	359	GT	Goodyear Tire & Rubber Co	2510	Automobiles & Components
956	971	217	ADCT	ADC Telecommunications Inc	4520	Technology Hardware & Equip
957	490	497	DYN	Dynegy Inc	5510	Utilities
958	975	114	EK	Eastman Kodak Co	2520	Consumer Durables & Apparel
959	392	.	LTR	Loews Corp	4030	Insurance
960	973	.	BBI	Blockbuster Inc	2550	Retailing
961	346	89	WMB	Williams Cos Inc	5510	Utilities
962	985	999	MCH	Millennium Chemicals Inc	1510	Materials
963	522	49	FON	Sprint Fon Group	5010	Telecommunication Services
964	989	60	XRX	Xerox Corp	4520	Technology Hardware & Equip
965	782	244	CNP	Centerpoint Energy Inc	5510	Utilities
966	98	379	EP	El Paso Corp	5510	Utilities
967	164	152	BA	Boeing Co	2010	Capital Goods
968	983	.	VC	Visteon Corp	2510	Automobiles & Components
969	956	.	RRI	Reliant Resources Inc	5510	Utilities
970	972	.	CHTR	Charter Communications Inc	2540	Media

971	79	987	THC	Tenet Healthcare Corp	3510	Health Care Equipment & Svcs
972	980	370	JCP	Penney (J C) Co	2550	Retailing
973	881	.	MIR	Mirant Corp	5510	Utilities
974	228	533	TXU	Txu Corp	5510	Utilities
975	526	307	SANM	Sanmina-Sci Corp	4520	Technology Hardware & Equip
976	876	126	SLR	Solectron Corp	4520	Technology Hardware & Equip
977	990	291	HLTH	WebMD Corp	3510	Health Care Equipment & Svcs
978	273	220	S	Sears Roebuck & Co	2550	Retailing
979	117	.	HI	Household International Inc	4020	Diversified Financials
980	978	.	PRU	Prudential Financial Inc	4030	Insurance
981	965	.	RJR	RJ Reynolds Tobacco Hldgs	3020	Food Beverage & Tobacco
982	593	.	ONE	Bank One Corp	4010	Banks
983	976	.	UNM	Unumprovident Corp	4030	Insurance
984	954	142	ABS	Albertsons Inc	3010	Food & Drug Retailing
985	921	.	AWE	AT&T Wireless Services Inc	5010	Telecommunication Services
986	986	197	MCK	McKesson Corp	3510	Health Care Equipment & Svcs
987	991	121	GLW	Corning Inc	4520	Technology Hardware & Equip
988	249	.	FBF	Fleetboston Financial Corp	4010	Banks
989	348	65	HON	Honeywell International Inc	2010	Capital Goods
990	992	.	WB	Wachovia Corp	4010	Banks
991	995	324	VRSN	Verisign Inc	4510	Software & Services
992	994	1000	KIND	Kindred Healthcare Inc	3510	Health Care Equipment & Svcs
993	996	234	GM	General Motors Corp	2510	Automobiles & Components
994	719	56	MOT	Motorola Inc	4520	Technology Hardware & Equip
995	464	.	JPM	J P Morgan Chase & Co	4020	Diversified Financials
996	1000	7	AOL	AOL Time Warner Inc	2540	Media
997	999	12	LU	Lucent Technologies Inc	4520	Technology Hardware & Equip
998	997	223	JDSU	JDS Uniphase Corp	4520	Technology Hardware & Equip
999	993	26	SBC	SBC Communications Inc	5010	Telecommunication Services
1000	998	22	T	AT&T Corp	5010	Telecommunication Services