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Intellectual Capital's Importance for Corporate Performance

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Abstract

Title:	Intellectual Capital's Importance for Corporate Performance
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Authors:	Gustav Ek, Marcus Klang, and Martin Nilsson
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Key words:	Intellectual Capital, Corporate Performance, VAIC, Panel data regression, Prediction models
Purpose:	Empirically investigate the relationship between intellectual capital and corporate performance. The estimated models will be used to predict future corporate performance.
Theory:	Definitions of Intellectual Capital are presented as well as measurements of the concept, with focus on VAIC. Prior research investigating the relationship between intellectual capital and corporate performance are brought forward.
Methodology:	A quantitative approach is used to investigate the relationship between intellectual capital and corporate performance. Panel data regressions are used to analyze the relationship and estimate prediction models.
Empirical results:	823 observations have been collected during the period 1998-2007. The sample is divided into nine different industries. The mean VAIC for the total sample was 3.51, the average market-to-book ratio 3.17, the mean return on assets 5.40 percent, and finally, the average asset turnover was 0.98 times.
Conclusion:	There is a positive relationship between intellectual capital and profitability. When controlling for firm size and leverage, there is positive relationship between intellectual capital and market valuation. For accurate predictions of corporate performance, more factors than intellectual capital, firm size and leverage, are needed to be included in the models.

Sammanfattning

Titel:	Intellectual Capital's Importance for Corporate Performance
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Kurs:	FEKP01, Degree Project Master Level, 15 ECTS
Författare:	Gustav Ek, Marcus Klang, and Martin Nilsson
Handledare:	Göran Anderson
Nyckelord:	Intellektuellt kapital, företagsprestation, VAIC, Panel data regression, prediktionsmodeller
Syfte:	Empiriskt undersöka relationen mellan intellektuellt kapital och företagsprestation. De skattade modellerna kommer att användas till att prediktera framtida företagsprestation.
Teori:	Definitioner av intellektuellt kapital presenteras samt metoder att mäta konceptet, med fokus på VAIC. Tidigare forskning vilken undersöker relationen mellan intellektuellt kapital och företagsprestation lyfts fram.
Metod:	Ett kvantitativ angreppssätt används till att undersöka relationen mellan intellektuellt kapital och företagsprestation. Panel data regression används för analys av relationen samt till att skatta prediktionsmodeller.
Empiri:	823 observationer har samlats in under perioden 1998-2007. Urvalet har delats in i nio olika industrier. Medelvärdet för VAIC i hela urvalet var 3,51, det genomsnittliga market-to-book ratio 3,17, avkastning på tillgångar 5,40 procent och omsättningshastigheten för tillgångar 0,98 gånger.
Slutsats:	Det finns ett positivt samband mellan intellektuellt kapital och lönsamhet. När företagets storlek och skuldsättning inkluderas i modellen finns det ett positivt samband mellan intellektuellt kapital och marknadsvärdering. För mer precis prediktion av företagsprestation behöver fler faktorer än intellektuellt kapital, företagets storlek, samt skuldsättning inkluderas i modellen.

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1 Introduction

In this chapter, the topic of the thesis is introduced and its importance highlighted. A background serves as a prelude to the problem discussion, which ends with the research questions the thesis will address. The purpose is further stated along with the thesis' delimitations and target audience.

1.1 Background

The traditional factors of production, capital, land, and labour, have since Adam Smith developed his framework in the late 18th century, been the cornerstone for the view of how a company creates value (Smith, 1776). However, during the latter decades of the 20th century, the traditional factors of production have significantly altered, leading to alternative views of how the firm is being proposed, whilst intellectual capital (IC) became recognized as the major force behind wealth creation (Firer and Williams, 2003; O'Donnell, 2004). Knowledge is fast replacing traditional factors of production as the industries of today are no longer competing on the basis of natural resources but rather on the basis of brainpower or knowledge, implying that knowledge may well be the most meaningful resource of today (Drucker, 1993). Thus, intangible assets like knowledge and innovation are more important for business success than tangibles such as, mass, size or physical assets (Rastogi, 2000). Several authors agree that one of the major reasons why IC and its management have become so important lately is a result from the outburst of the knowledge economy in the last three decades (Stewart, 1997; Edvinsson and Malone, 1997; Sveiby, 1997).

The interest and the research of IC have been growing over the last decades. Much of the research has aimed at defining the concept (Stewart, 1994; Stewart, 1997; Edvinsson and Sullivan, 1996; Edvinsson, 1997; Andriessen, 1996; Roos 2001), while other parts of the literature have tried to measure it (Bontis, 2001; Sveiby, 2005; Pulic, 1998; Edvinsson, 1997; Guthrie *et al.* 2001; Andriessen, 2004a).

There is no generally accepted definition of IC, but many authors have offered views which provide a general concept. Stewart (1997) defines IC as "packaged useful knowledge". This includes an organization's processes, technologies, patents, employee's skills, and information about customers, suppliers and stakeholders. Brooking (1996) defines the concept as the term given to the combined intangible assets which enable the company to function. In 1997, Edvinsson came up with the first formal definition of IC. He defined IC as the possession of knowledge, applied experience, organizational technology, customer relationships and professional skills which provide a competitive edge in the market. This definition was expanded by Miller (1999) to include the organization's relationships and community influence, and in 2000, when Roos included both internal as well as external organizational relationships. Based on these theoretical definitions, IC is the economic value of two categories of intangible assets of a company, namely human and structural capital. Human capital is defined as all individual capabilities, knowledge, skills and experience of an organization's employees and managers, while structural capital is defined as the dealings with mechanism and structures of the organization which can help support employees in their quest for optimal intellectual performance (Petty and Guthrie, 2000; Andriessen, 2006; Bontis *et al.* 2000; Bozbura, 2004).

While IC is generally intangible in nature, it is becoming widely accepted as a major corporate strategic asset capable of generating sustainable competitive advantage and superior financial performance (Barney, 1991). Therefore, it is not surprising to find that these knowledge embedded resources or IC, now are the firm's most valuable assets (Karlgaard, 1993).

However, traditional accounting and financial statements fail to measure and reflect the true value created by intangibles, since the balance sheet does not measure, recognize or report the organization's IC (Khan, 2008). The increasing gap between firms' market and book values show that traditional balance sheets are unable to reflect the true value of the companies. Over the period of 1977-2001, the market-to-book ratios for US companies increased from slightly above 1 to over 5, implying that 80 percent of corporate market value has not been reflected in financial reporting (Lev, 2001b). The limitations of financial statements in explaining firm value underline the fact that the source of economic value is no longer material goods, but the creation of IC (Chen *et al.* 2005).

Williams (2001) and Brennan (2001), point out the importance of disclosing IC on the balance sheet for companies and the complications regarding the

disintegrated definition of measuring the phenomenon. Martin (2004) argues that it has been even clearer in the present that accounting cannot fulfill the need of measuring the most important assets and activities, IC and knowledge work. Poor performance of conventional accounting to determine internally generated intangibles such as R&D, employees, and brands, will exclude the very items considered the engine of present economic growth (Osterland, 2001).

Just as there is no generally accepted definition of IC, there is no universally accepted method of measuring it. Earlier methods' lack of assessing business success and IC in an objective way, made Pulic (1998) develop Value Added Intellectual Coefficient (VAIC) as a new way of assessing IC. Instead of directly measuring firms' IC, Pulic proposed a measure of the efficiency of value added by corporate intellectual ability, VAIC. Thus the higher the VAIC coefficient, the better management utilizes the company's value creation potential (Pulic, 2000). The major components of VAIC can be seen from a firm's resource base; physical capital, human capital, and structural capital. VAIC is an analytical procedure designed to enable management, shareholders, and other stakeholders to effectively monitor and evaluate the efficiency of value added by a firm's total resources and each major resource component (Firer and Williams, 2003). The main advantages of using the VAIC methodology when assessing and measuring IC within firms, are that it produces quantifiable, objective and quantitative measurements without the requirement of any subjective grading and awarding of scores or scales, and that it makes use of public or published financial data, which may enhance the reliability of the measurement (Williams 2001).

A growing body of literature has tried to analyze the links between IC and corporate performance. IC scholars have defined and measured corporate performance in a number of different ways, often using traditional accounting methods. Firer and Williams (2003) and Shiu (2006) use return on assets, asset turnover, and market-to-book ratio, to capture dimensions of profitability, productivity, and market valuation, respectively.

1.2 Problem discussion

If IC, as suggested by the discussion above, really is the firm's most valuable asset, a reasonable way of examine the justification of this would be to analyze

the relationship between a company's IC and corporate performance. If a high level of IC within a company has a positive relationship with for example return on assets, IC contributes to the value creation for the company and is therefore valuable. Companies with high IC should, according to several studies, be the basis of competitive advantage, and thus successful corporate performance (Bontis, 2001; Edvinsson and Malone, 1998). If VAIC measures the efficiency of value added by corporate IC as proposed by Pulic, then a company with a high VAIC coefficient should be well-performing, i.e. there is a positive relationship between a company's IC and its performance.

Prior research investigating the relationship between VAIC and corporate performance has come to mixed conclusions. In studies conducted in Europe and Taiwan a positive relationship between VAIC and corporate performance has been found (Pulic, 2000; Chen *et al.* 2005; Shiu 2006). In countries such as South Africa and Hong Kong no conclusive evidence were found (Firer and Williams 2003; Chan 2009). In Sweden, IC, as a topic is highly prioritized, both within the academic world and for the practitioner. With Sweden´s high portion of educated workforce and knowledge-intensive companies, IC ought to play a vital role for corporate performance. Investments in intangibles are estimated to reach 20 percent of the country's GDP (www.intellectualcapital.se). Hence several factors make an investigation of the relationship between IC, measured by VAIC, and corporate performance interesting. A comparison with earlier research conducted in other countries would be possible. Secondly, a positive relationship would justify the large investments in intangibles made in Sweden. Furthermore, distinctions might be possible to make between industries where IC is the most important factor of value creation and industries where traditional factors of production still are the most important.

Apart from investigating the mere relationship between VAIC and corporate performance and differences between industries, the issues can be addressed by taking an investor's perspective. From an investor's viewpoint, VAIC's relationship with corporate performance might affect the valuation of a given company. If VAIC is positively related to the market-to-book ratio, a company with a high VAIC can get a higher valuation compared to a similar company with a lower VAIC. Thus, the estimated models, which test the relationship between IC and corporate performance, might be used as tools for investors predicting future performance for companies.

The above discussion leads to the following research questions:

- What is the relationship between a firm's VAIC and corporate performance?
- Are the estimated models able to predict future corporate performance?

1.3 Purpose

The purpose of our thesis is to empirically investigate the relationship between intellectual capital and corporate performance. The estimated models will be used to predict future corporate performance.

1.4 Delimitations

The study will investigate the relationship between IC and corporate performance among the 100 most traded companies on the Stockholm Stock Exchange. This limitation is based on the fact that financial statements are needed to compute the VAIC measure and measures of corporate performance; hence the need of accounting information for the examined firms directs the sample to the most publicly traded companies in Sweden. Furthermore, the choice of the 100 most traded companies as frame for the sample selection gives the opportunity to investigate differences between industries with respect to IC and its relationship with corporate performance, since companies from different industries are included in the selection.

The research period is ranging from 1998 to 2007, thus the relationship will be investigated over ten years. 100 companies will be investigated each year during the research period resulting in a total of 1000 observations, hence general conclusions (if found) should be possible to make based upon the sample. Furthermore, the sample period captures both downturns (the IT crash in the end of the 1990s and the early 2000s) and upturns in the economic markets (2002-2007).

1.5 Target audience

The thesis is targeting students and professionals interested in IC and performance specifically and corporate finance in general. Considering the growing importance of IC as a cornerstone of competitive advantage, the thesis should also be beneficial for management when strategically evaluating investments in IC. Furthermore, the estimated models might be used by investors when predicting future corporate performance. Basic knowledge in statistics and econometrics are necessary to be able to grasp the full potential of the thesis.

2 Theory

In this part the theoretical framework, which the thesis is based upon, is presented. A short presentation of the historical development of intellectual capital is followed by a definition of the concept. Different methods of measuring intellectual capital are then presented and lastly prior research about the relationship between intellectual capital and corporate performance are brought forward.

2.1 Historical development of Intellectual Capital

The development of intellectual capital (IC), as a topic, can be divided into two time-periods. Most of the research belongs to the first period, the development of an IC-framework. This period has focused on raising awareness and recognizing the potential of IC in shaping and managing a firm's sustainable competitive advantages. Period two is concerned with the consolidation of the current research and establishment of IC as a legitimate undertaking. The primary focus is to find an answer of the process of measuring and managing IC (Petty and Guthrie, 2000).

According to Petty and Guthrie (2000), several arguments have been brought forward in support of understanding IC (Brooking, 1996; Marr and Chatzkel, 2004; Sveiby, 1998; Bontis, 2001; Petty and Guthrie, 2000). The arguments are ranging from an intuitive understanding that IC matters (Stewart, 1997), to the importance of recognizing IC's potential to improve the efficiency of both capital and labour markets (Bukh *et al.*1999; OECD, 1999).

The new economy is principally driven by information and knowledge, and according to OECD (1999), this is the reason of the increasing prominence of IC as a research and business topic. IC is in one form or another, integrated in current economic, managerial, technological, and sociological developments in a greater extent than which was previously known. Several authors argue for the importance of IC, because of numerous reasons such as, the revolution of information technology, the greater importance of knowledge, changing patterns of interpersonal activities and networks, and innovation as the

emerging determinant of competitiveness (Allee, 1997; Boisot, 1999; Dawson, 2000; Sullivan and Sullivan, 2000).

Roos *et al.* (1997), argue that IC also can be linked to other disciplines such as corporate strategy and the development of measurement tools. Assessing IC from a strategic perspective, it is the driver in the creation and usage of knowledge to enhance corporate value. In contrast, the measurement disciplines focus on the development of reporting standards constructed to capture the non-financial, qualitative items of IC which are supposed to being measured alongside conventional and quantifiable financial data (Johanson *et al.* 1999).

2.2 Definition of Intellectual Capital

Edvinsson and Malone (1998) are explaining the idea of IC with the use of a metaphor, where the organization could be observed as a living organism, e.g. a tree (figure 2.1). One can imagine those organizational plans, annual and quarterly reports, firm publications, and other documents as the trunk, branches and leaves. A rational investor will examine the tree whether she could harvest ripe fruit or not. But only assuming that the tree only consists of the visible parts is a mistake.

Figure 2.1 The Knowledge Tree (Edvinsson, 2008)

More than half of the tree is below the surface in the roots. The presentation of the current health of the tree could be found while looking on the colour of the leaves and the taste of the fruits. But it is even more effective to look what goes on in the roots to observe the future health of the tree. There could potentially be rot below the surface, as time is passing, may kill the tree which presently looks healthy, or it might be nutritious and more valuable than first believed. This metaphor is stressing the importance of looking at the roots of a firm's

value, measurement of the dynamic factors, which are found below the observable surface of an organization's buildings and products.

Edvinsson, as mentioned before, developed the first formal definition of IC in 1997. This formal definition was the result from his previous research for the Swedish company, Skandia, in 1994. In his first attempt, Edvinsson defines IC as human capital added to structural capital. Human capital is the knowledge, skill and capability provided by the employees. The human capital is a source of innovation and renewal within the organization (Petty and Guthrie, 2000). Structural capital is everything still in the building when everyone has left for the day, e.g. databases, software, trademarks, culture etc. It embodies, empowers and supports human capital (Skandia, 1994; Stewart, 1997; Petty and Guthrie, 2000). Edvinsson (1997), later on, developed these thoughts and ideas into a scheme shown in figure 2.2.

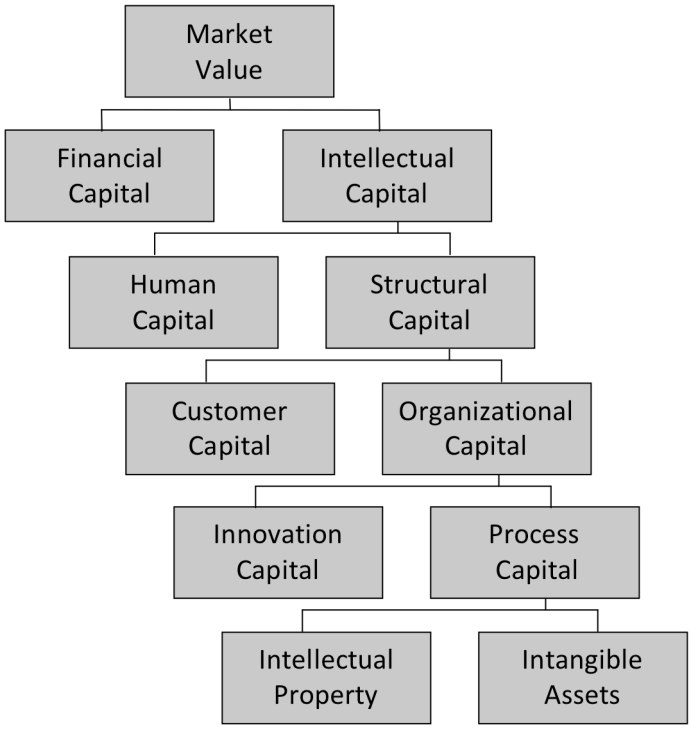

Figure 2.2 The Skandia IC-scheme (Edvinsson, 1997)

In the formal and later definition, Edvinsson argues that IC is something which provides a competitive edge in the market. Factors, which are used, are ownership of knowledge, applied experience, organizational technology, customer relationship and professional skill. Further, theoretical definitions have been adding other dimensions to this definition and many theorists are defining IC as the economic value of two categories of intangible assets, human capital and structural capital (Petty and Guthrie, 2000; OECD, 1999).

However, the general observation from IC-scholars is the lack of a common accepted definition of IC (Andriessen, 2004a; Marr and Chatzkel, 2004; Mouritzen; O'Donnel, 2004; Sveiby, 1997). The major complications arise from the limitations of clarification and agreement. The consequence will therefore be an aim for a clearer and unambiguous understanding of IC (Mølbjerg, 2006).

2.3 Measurement of Intellectual Capital

During the last decades, the IC community has developed a great amount of new methods to measure and value intangible assets (Andriessen, 2004a; Guthrie *et al*. 2003). Among the methods identified in the relevant literature, there is no universally accepted approach to measure IC (Bontis, 2001; Andriessen, 2004a; Sveiby, 2005; Mouritsen, 2004). In the present, the IC community has entered a consolidation phase and several authors have initiated for this direction (Chan, 2009; Bontis, 2001). In contrast Andriessen (2001) argues that the field of IC research must resist the temptation of finding one unified theory of the phenomenon. If this is done too early in the theory development, the field might end up rigid and hinder IC's practical usage. Bontis (2001) believes that the current measurement of knowledge is in an experimental phase, where there are several possible solutions and if the understanding of paradigms is correct and useful, then the community should overcome this critical step and find a standard definition and classification of how to measure the concept. The field of IC is more concerned with categorizing and theory building, than actually testing the theories' effectiveness (Marr *et al.* 2003).

Bontis (2001) criticizes the many similarities, which exist between different IC measures. The constructions and measures differ from each other merely by their labels. The result from this is both positive and negative for the field of IC studies. The positive aspect is that researchers are narrowing their frameworks and focusing on the main important concepts which are consistent across perspectives. Since the field is still in its youth, none of the researchers are willing to give up on their own ideas and build on each other's work. A potential solution could occur as the field improves further and the desire for more valid and general measures emerges.

Today there are four categories, according to current literature, measuring IC; the Market Capitalization Approach (MC), the Direct Intellectual Capital

Approach (DIC), the Return on Assets Approach (ROA), and the Scorecard Approach (SC) (Sveiby, 2007; Nazari and Irene, 2007). Sveiby's (2007) categorization is an extension of the classifications suggested by Luthy (1996) and Williams (2001). Sveiby's (2007) attempt to categorize the ways to identify and measure IC did not include the VAIC methodology, which recently has gained in popularity (Chan, 2009; Chen *et al*. 2005; Firer and Williams, 2003; Shiu, 2006; Nazari and Irene, 2007).

The four approaches are offering different advantages and disadvantages. The methods offering monetary valuations, such as the ROA or the MC approach, are helpful in M&A decisions and for the valuation of stocks. These kinds of methods are also appropriate to use in industry analysis and to concretize the financial value of IC. A general drawback in the usage of monetary methods is the translation of everything into monetary terms. This can be too shallow when not digging enough beneath the surface to find the underlying values of IC. The ROA approach is also sensitive to interest rate changes and assumptions regarding the discount rate. Many of the methods within these two approaches can be are hard to apply when it comes to non-profit organizations, internal departments, and public sector companies (Sveiby, 2007).

Looking on the other two approaches, DIC and SC, their major advantage is the ability to shape a more comprehensive picture of a firm than monetary metrics. These methods are easy to apply at any level of the organization. The DIC and SC approaches make it possible for a closer measurement of a certain events and feedback is easier made to different parts of the organization. They are not suffering from the need of measures in monetary terms and are thereby useful for non-profit organizations, internal departments, and public sector companies. Drawbacks for these methods are the need of customization for each organization and each purpose, which will make it harder for comparisons. The methods are also new and have to be accepted by societies and managers who are usually familiar with pure monetary terms (Sveiby, 2007).

As discussed above, there is no standardized way to measure IC. In order to give the reader a comprehensive view over the research conducted on IC, the following part explains the major models used for measuring it. The categorization is done in accordance with Sveiby (2007), while the new VAIC methodology is presented lastly.

2.3.1 The Market Capitalization Approach

The first approach according to Sveiby's (2007) categorization is the Market Capitalization approach (MC). This approach calculates the difference between the company's market capitalization and stockholders' equity as its IC (Sveiby, 2007). In order to accurately use any of the MC methods, the historical financial statements must be corrected for the effects of inflation or replacement costs. A particular drawback, when using this approach, relates to industries with a large proportion of old capital assets, since replacement costs need to be found. Further, the MC methods assume that the difference between the market value and the book value only consists of intangible assets. A part of this value difference may still need to be addressed with something like "market sentiment", a specific factor or weight which will correct the value of intangibles when adjusted (Rodov and Leliaert, 2002).

The most important methods within the MC approach are Tobin's Q, Market-to-book ratio and Financial Method of Intangible Asset Measuring (FiMIAM). The Market-to-book ratio and Tobin's Q are both calculating the value of IC as the difference between the market value and the book value of organizations (Andriessen, 2004a). These methods can be useful in the search of improvements in internal management and external reporting. FiMIAM is built on the assumption that the premium of a firm's value derives from its IC (Stewart, 1997; Luthy, 1996).

2.3.1.1 Tobin's Q

Tobin's Q is the ratio of the market value of a company's debt and equity to the replacement cost of its assets in place (Damodaran, 2002). Changes in the q-value provide a proxy for measuring a potential overvalue or undervalue of the company's stocks and thereby the effective performance of a firm's IC (Sveiby, 2007). No risk adjustment or normalization is required to compare q-values between companies, in contrast to comparisons of stock returns or accounting performance measures (Lang and Stulz, 1994). If a firm operates and invests in assets which are expected to create value, then the q-value will be greater than 1. The more value created, the higher q-value is expected (Habib and Ljungqvist, 2005).

The drawback by using Tobin's Q, as a measure of IC, is the ignorance of the replacement costs for intangible assets, due to the fact of accountants' treatment of intangibles (Lev, 2001a). The tangible assets are capitalized and

reported on the financial statements. The intangibles are expensed as something that is written off on the income statement with other regular expenses as wages, interest and rents. The consequence from this is that book values of assets are missing the amount of intangibles (Chen and Chen, 2005).

2.3.1.2 Market-to-book-ratio

The market-to-book ratio presumes that the value of a company is approximately worth tangible and intangible assets, which is indicated by its market value. The market value is calculated by taking the price per share of common stock multiplied by the total amount of shares outstanding. The IC will be an approximate measure of the difference between the book value shown on the firm's balance sheet and the market value (Stewart, 1995).

Luthy's (1996) argues that the market-to-book ratio is more reliable and useful, since factors as interest rates and general economic cycles will impact all companies quite equally, thereby are some irrelevant factors eliminated. The market-to-book-ratio by itself has got limited value for a couple of reasons; primarily, stock prices are affected due to economic factors not associated with a company's tangible or intangible assets (Fama and French, 1993). Furthermore, book values are representing depreciated historical costs, which barely correspond to the actual value of revenue contributing assets. Stewart (2001) is visualizing the complication regarding the usage of the book value. In the end of the 1970's, the book value was 95 percent of the market value. In the beginning of the new millennium, the same number had declined to just 28 percent of the market value. The conclusion from this is that investors are not addressing the same value as what accountants are classifying as value (Lev, 2001b).

2.3.1.3 Financial Method of Intangible Assets Measuring

The last method which falls into the boundaries of the MC approach is the Financial Method of Intangible Assets Measuring, (FiMIAM). Stewart (1997) argues that the FiMIAM builds on the advantages of prior methods to measure IC, being both quantitative and broad and at the same time concise and simple. FiMIAM is linking the IC value to the market value over and above the book value. Sveiby (2007) is classifying this theory as a combination of the DIC and MC approach. FiMIAM is assessing monetary values of IC components, a combination of both tangible and intangible assets measurement.

The major drawback of FiMIAM is the lack of precision in comparison to other balance sheet numbers. However, the model could constitute as a benchmark measure, where the intangible value can reflect whether the company is losing or gaining value not visualized with the traditional accounting measures (Luthy, 1996).

2.3.2 Direct Intellectual Capital Approach

The second approach, according to Sveiby (2007), is the Direct Intellectual Capital approach (DIC). These methods estimate the value of intangible assets by identifying its various components. When these components are identified, they can directly be evaluated, either on an individual basis or as an aggregated coefficient (Sveiby, 2007). Components as market assets, customer loyalty, intellectual property, technology assets, human assets, and structural assets e.g. information systems, are the main factors in the DIC approach. Once all of these components have been measured, the total value of a company's IC can be derived (Rodov and Leliaert, 2002).

The main disadvantage, by using this approach, is the requirement of a large number of components which need to be identified and measured, which will make it complex (Rodov and Leliaert, 2002). Advantages of the DIC methods are the ease of appliance at any level of the organization and a more detailed measure of IC. The methods are measuring IC resources from a bottom up perspective and can therefore be quicker and more accurate than ROA and MC measures (Roos *et al.* 2006*).* According to Sveiby (2007), Citation-Weighted Patents, Technology Broker, and various DCF methods are the most important methods within the DIC approach.

2.3.2.1 Citation-Weighted Patents

The Citation-Weighted Patents method is calculating the IC and its performance by the impact of research development efforts. Number of patents and expenditure of patents to sales turnover are used as the description of the firm's IC (Sveiby, 2007). The Citation-Weighted Patents theory consists of a six-step process to address and manage IC assets. The first step is to define the role of knowledge in the business. Secondly, assess the competitors' strategies and knowledge assets. Thirdly, determine the company's portfolio of knowledge assets. The forth step is to set a value of those assets to keep, develop, abandon

or sell. Step five is to invest in areas where gaps have been located. The last and final step is to gather the new knowledge portfolio and constantly improving it. Hall *et al*. (2005) are categorizing R&D as an intangible asset which could be viewed as the organization's knowledge stock. This indicates that the investments in R&D should be capitalized in the firm's market value. The value of patents as a proxy for R&D success has got a number of weaknesses by the large variance in the significance or value of individual patents, thereby are patents as an indicator of R&D success a very noisy indicator (Bontis, 2001).

2.3.2.2 Technology Broker

In the Technology Broker method, the firm's IC will be assessed based on a diagnostic analysis of the company's response to twenty questions regarding four components of IC, human-centered assets, intellectual property assets, market assets, and infrastructure assets (Sveiby, 2007). The Technology Broker method assists the calculation of a financial value of IC. The market assets are associated with the potential a company has within market-related intangibles, such as brands, customers, distribution channels, contracts and agreements. The human-centered assets consist of the collective expertise, creative and problem-solving capability, leadership, entrepreneurial and managerial skills personified in employees of the firm. The intellectual property assets are the legal mechanism for protecting several corporate assets, and infrastructure assets such as know-how, trade secrets, copyright and patent. Lastly, infrastructure assets constitute those technologies, methods and processes which will make it possible for the organization to operate (Brooking, 1996).

The major weakness of the Technology Broker is the overhanging leap that must be made from the qualitative conclusions of the questionnaire to classify these assets into real monetary values. Also the questionnaire's ability to stay objective in the auditing is a danger by itself (Lynn, 1998a).

2.3.2.3 DCF methods of IC measurement

Within the DIC approach, there is a group of methods which are based on discounting future cash flows as a mean of measuring IC. Pedrini (2007) has classified Accounting for the Future (AFTF), Inclusive Valuation Methodology (IVM), and The Value Explorer as the main models among DCF methods of IC measurement.

AFTF is a model where the IC value is measured by calculating all future cash flows where factors not affecting the future cash flows are classified as irrelevant and excluded in the calculation. The IC will be captured by the future and those assets are exactly the ones missing for the traditional accounting. The intangibles will be the factors which provide the company with shareholder value creation (Singhal, 2004). The difference between AFTF from the beginning to the end of the period is characterized as the value added during the period (Sveiby, 2007). The IVM uses hierarchies of weighted indicators which are integrated, and focused on relative rather than absolute values (McPherson and Pike, 2001). Combined value added equals the monetary value added plus the intangible value added (Sveiby, 2007). The IVM has contributed to the IC field with a multidimensional IC measurement. This method consists of three steps; step one is to create a mathematical model of the firm's business to simulate different management actions. The second step is to use a criterion hierarchy, where each attribute will have a maximum and minimum value being defined. Lastly, the output performance measures are used as inputs for the criterion hierarchy to calculate the overall combined IC (McPherson and Pike, 2001). Andriessen (2004a) is supporting the IVM method when it comes to the interdependence of the three categories of IC and that the market value is not sufficient by just taking book value plus the IC value.

The Value Explorer is a method for the identification and financial valuation of intangible resources. The Value Explorer is based on core competencies within the organization which are strategic important for IC (Andriessen, 2005). The core competencies consist of the development and maintenance of unique skills of the employees. The companies' true value cannot be captured in the products or services which the company provides or in its market share (Hamel and Prahalad, 1994). The company should identify its core competencies and address the added value, potential, sustainability, competitiveness and robustness of those core competencies. Then the company should set a certain amount of the expected earnings of the firm to the specified core competencies. Once this has been done, the management should conclude how to improve its IC value (Andriessen, 2005).

The major disadvantages by using DCF models to calculate the IC value are the overhanging problems to distinguish between tangibles and intangibles. When expressing the value of the tangible assets, some of those are included in the generation of earnings, and therefore there is a risk for double counting their value (Sullivan and Sullivan, 2000). Andriessen (2004a) argues that the hardest obstacle to overcome is the challenge to develop a valid mathematical model of

a real firm and the development of independent indicators. Furthermore, these methods are complex, and will be hard to use at the boardroom level.

2.3.3 The Return on Assets Approach

The third approach according to Sveiby (2007) and his attempt of categorization, is the Return on Asset approach (ROA). This approach consists of several methods all with the similarity of providing a financial value of IC. The basic model is derived from the pre-tax earnings divided by its intangible assets. The difference, between the ratio and its industry average, is multiplied by the firm's average intangible assets. Dividing the average earnings from its intangibles by the company's cost of capital; one can derive an estimated value of its IC (Sveiby, 2001). As a measurement tool, the ROA category is superior due to the fact that it actually provides the user with a value. Contrary, ROA lacks the possibility to proactively manage IC, since the measures are backward-looking (Rodov and Leliaert, 2002). The main methods within this approach are Economic Value Added and Calculated Intangible Value method (Sveiby, 2007).

2.3.3.1 Economic Value Added

The Economic Value Added (EVA) model was introduced as a tool of measuring wealth maximizing for shareholders (Bontis *et al.* 1999). EVA measures the economic profit of a company and looks at the business as a whole (Bontis, 2001). It is calculated as the difference between the net operating profit after tax and the opportunity cost of invested capital, calculated as the weighted average cost of capital and the amount of capital employed (www.sternstewart.com). Its main objective is to address poor management decision-making which could destroy shareholder wealth. EVA should help the management by searching for new indicators of wealth, instead of just looking on the accounting-based earnings (Andriessen, 2004a).

The main advantages, of the method, are its strong correlation with stock prices, and the easiness for managers to discuss value creation. However, there is a lack of explaining IC with help of the model. EVA does not explicitly relate to the management of intangible assets, but it is argued that effective management of knowledge assets will increase EVA. Some researchers are supporting the idea to use EVA as a measure of the stock of IC (Bontis *et al.* 1999). Rodov and Leiaert (2002), stress the complexity of the method. In order to grasp the components

of the calculation, there are several adjustments which need to be made. They also emphasize that EVA uses book assets relying on historical costs, and the understanding of current events lessen the opportunity of measure intangible assets. Finally, Bontis *et al.* (1999), claim that EVA is better at explaining stock prices, than measuring intangible assets, and the measure may not be useful when it comes to quantifying the value of intangibles.

2.3.3.2 Calculated Intangible Value

Inspired by a method used to evaluate brand equity the Calculated Intangible Value (CIV) was developed as a process to measure IC (Stewart, 1995). A premium of intangible assets is achieved by comparing the company's return on assets with the industry average. Pre-tax earnings are deducted by the factor of the industry's ROA multiplied by the company's average intangible assets. The CIV is achieved after adjusting for the tax effect and calculating the net present value of the premium by using the company's discount rate (Stewart, 1995).

Stewart (1995) argues that the approach is a valuable tool for entrepreneurs presenting ventures for investors, especially when considering the fact that several successful ventures do not have any tangible assets. Luthy (1996) believes that CIV is not having the same precision as other financial statement numbers. But the CIV could help firms to analyze whether the true value is reflected in the traditional balance sheet. Furthermore, when it comes to knowledge-based organizations with few tangibles, this method could be useful in association with their traditional accounting principles. The value which the IC could create may be more valuable than the tangible assets on the financial statements. Kujansivu and Lönnqvist (2007) are also visualizing the importance of comparisons between industry participants and that those data is hard to find.

2.3.4 The Scorecard Approach

The fourth and final approach according to Sveiby's categorization is the Scorecard approach (SC) (Sveiby, 2007). Kaplan and Norton (1992) argue for the use of a balance scorecard, a management tool which can give you a comprehensive perspective over a firm's performance. The idea is to complement financial measures, such as return on assets and profit margin, with operational measures on customer satisfaction, internal processes, and the

organization's innovation and learning activities. The financial measures are results of actions already taken, while the operational variables will be the drivers of future financial performance (Kaplan and Norton, 1992). The score-card approach is one of the most common methods for measuring and managing IC (Chan, 2009).

Sveiby (1997; 2001a), uses a scorecard approach to measure IC. It is made upon the idea of the invisible balance sheet, which also can be found in Edvinsson's (1997) research. The visible component is the ordinary balance sheet which can be seen in the annual report. It visualizes the material assets and shows how they are being financed. The annual report will only tell a minor part of the total value of a firm since the inconsistency between the book value and the market value. Edvinsson (1997) proposes that IC should be considered as debt, i.e. an obligation to the stakeholders of the firm, such as employees and suppliers. The counterbalance on the asset side would be the goodwill or non-financial capital. With this tentative balance sheet, Edvinsson is trying to communicate that IC is the hidden value of the firm.

The methods within the SC approach are analyzing the various components of IC, and these indicators are generated and reported in scorecards or as graphs. Both SC methods and DIC methods give a deeper understanding of the companies' IC than financial metrics. SC methods do not, however, provide a monetary value of the intangibles. The main methods in the SC approach are the Intangible Asset Monitor, the Scandia Navigator and the IC-Index Approach (Sveiby, 2007).

2.3.4.1 The Intangible Asset Monitor approach

Annell and Sveiby (1989), suggest that the intangible part of the balance sheet can be divided into three parts, internal structure, external structure, and individual competence. The value of the three parts is made up with the usage of various ratios which in turn can be divided into four subcategories, growth, innovation, efficiency, and stability (Sveiby, 2001a).

The internal structure embodies patents, concepts, models, culture, computer and administrative systems. The employees are creating these which are generally owned by the organization and can be acquired by others. People together with the internal structure are what we in general call the organization (Sveiby, 2001a). The main activity of employees, who work in general

management, administration, accounting etc, is to maintain the internal structure. They are referred to as the support staff and activities such as, routine maintenance of computer systems and databases should also be accounted under this category, if they are not associated with a specific customer or group of customers (Sveiby, 1997).

The external structure is the relationship with customers and suppliers, brand names, reputation and trademarks. The value of the external structure is mostly impacted by how well the company solves its customers' problems. Relationships and reputation can be good or bad and can change over time. Customers are contributing with much more than just money (Sveiby, 2001a). They are providing employees with training, spread the company's image, and customers' feedback is a source of developing new products and services. These flows can be named intangible revenues because of the fact that they impact the value of the intangible assets. Intangible revenues can be divided into three parts, image enhancing, organization enhancing, and competence enhancing (Sveiby, 2001b).

The individual competence is the ability of people to act in various situations. The individual competence includes education, professional capabilities, experience and social skills. It cannot be owned by anyone or anything; it belongs to the person who possesses them. Although, this could be included on the balance sheet since the organization will not be able to operate without its employees. Professionals, included in this measure, refer to the people who plan, produce, and present the products or services the clients ask for. People in the support function are excluded since they belong to the internal structure (Sveiby, 2001a).

2.3.4.2 The Skandia Navigator

The Skandia Navigator is made up of ratios, which are divided into two categories; financials and IC. The intellectual category is, in turn, divided into four subcategories; the customer focus, the process focus, the human focus and the renewal and development focus. The idea is that the ratios of the IC category will drive the financial performance (Skandia, 1994), similar to the idea of the balance scorecard. This scorecard can be described with a house metaphor. The renewal and development is the base of the house, and becomes crucial for the sustainability. The customer focus and the process focus are the walls and the human focus, in the middle, is the soul of the house. All these

bricks make up the financial focus, the roof (Edvinsson, 1994).

Edvinsson (1997) argues that this approach together with the identification of IC helps management to define the values and relationships of each box. Furthermore, it gives the opportunity to adapt ratios to the circumstances of a business unit. Bontis *et al.* (1999) agree and state that the balance scorecard is excellent as a management system, especially as it enables companies to keep track of many dimensions in a systematic way.

Even though, Bontis *et al.* (1999) agrees with using the balance scorecard as a management tool, it has its weaknesses when it comes to measure IC. First it is criticized for being too rigid regarding identification of key success factors, the four perspectives, and that the external environment is limited to customers when in reality it consists of several other stakeholders. Secondly, innovation is considered a routine, something created by an IT-system, not managed by the people of the organization. Finally, no external comparison is possible (Bontis *et al.* (1999). Sveiby (2001b) agrees on the disadvantage of comparability. The metrics used are often conceptual and have to be customized for each business using them. Furthermore, none of the scorecard models reveal a monetary value, even though they offer a proxy measure to track trends in assumed value added (Lynn 1998b). Scorecard models based on the balance sheet approach, as the Skandia Navigator and the Asset Monitor, give a snapshot view of the situation and do not represent the more realistic, dynamic knowledge flow of an organization (Roos and Roos, 1997).

2.3.4.3 The IC-Index Approach

The IC-index approach attempts to group various metrics into one single index and to correlate the changes in the index with the movements of the market. The benefit of the index is that it is a distinctive measure and focus on monitoring the dynamics of IC. Furthermore, it provides a single and comprehensive view of a company which is different from an examination of physical assets (Roos *et al.* 1997).

Roos *et al.* (1997), propose that company strategy and those forms of IC which helps the company realize its goals should be the guiding factor in deciding what type of IC, structural or human, to highlight in an IC-index. The weights distributed, should be based upon the characteristics of the business. Finally, the day-to-day operations will determine the specific measures which are

feasible to use.

The benefit of the index is that it visualizes the creation and flow of IC (Skandia, 1997). Rodov and Leliaert (2002), emphasizes the advantage which the index provides lists of individual metrics requiring management to understand the priorities and relationships which exists between different measures. Bontis (1999) argues that the IC-Index allows managers to understand the impact various strategies have on IC. Moreover, it helps managers to evaluate projects from an IC point of view. As for the other scorecard approaches, the IC-index is limited in its universality among peers. The value of the IC-index lies in its measurement of changes in IC flows (Bontis, 2001).

2.4 Value Added Intellectual Coefficient

The Value Added Intellectual Coefficient (VAIC) methodology was introduced in 1998, as an indicator which shows the ability of a company's value creation, and represents a measure for business efficiency in a knowledge based economy (Pulic, 1998). Most economic and financial models treat employees, the prime carries of knowledge, as a cost and not as a resource. The VAIC methodology redefine the status for employees, treating them as a key resource on the same level as financial and physical capital, that is, as an investment instead of a cost. However, IC alone cannot operate independently without the support of financial and physical capital, thus corporate intellectual ability, as measured by VAIC, is an indicator of the overall efficiency or ability of a company to use the total resources of IC and physical capital in creating value for the company. A higher VAIC coefficient shows that more value is created with the same amount of company resources (Pulic, 2004).

Apart from the fact that VAIC places an emphasis on the value of employees and treats human capital as the most important source of IC, which is consistent with all major IC definitions found in the literature, there are several other reasons to support the selection of this model as an appropriate proxy to measure IC and its performance. VAIC is easy to calculate using data already accounted for and reported in annual reports. The methodology used in the calculation of VAIC is relatively straightforward and enhances a greater understanding. Furthermore, the use of published financial data when calculating VAIC, enhance the reliability of the measurement (Williams 2001). Other advantages of the VAIC methodology are that it produces quantifiable,

objective and quantitative measurements without the requirement of any subjective grading, and it provides indicators which are relevant, useful and informative to all stakeholders (Chen *et al.* 2005). Finally, the method produces a form of standardized measurement, which makes benchmarking possible (Firer and Williams, 2003).

The main criticism against the VAIC method is the way which the three different efficiency ratios are added together to gain an overall measure of IC. Furthermore, the classification of all labour expenses as assets is criticized since some of the expenses generate direct benefits, meaning they should not be treated as assets (Andriessen 2004b).

The derivation of the VAIC coefficient involves a number of steps and begins with value added which, according to Pulic, is the most appropriate indicator for business success (Pulic, 2004). Value added shows the ability of a company to create value, and is calculated as the difference between output and input. The basic definition is:

VA = OUT - IN, where (1)

VA = value added for the company
OUT = total sales
IN = cost of bought-in materials, component and services

From the company accounts value added can be calculated as:

VA = OP + EC + D + A, where (2)

VA = value added for the company
OP = operating profit
EC = total employee expenses viewed as investments
D = depreciation
A = amortization

After VA is calculated, the computation of the efficiency of resources, intellectual and financial capital, follows in the subsequent steps. IC has two components, human capital and structural capital. All the expenditures for employees are embraced in human capital. This means, human capital efficiency (HCE), is obtained by treating the total expenditure on employees as an investment which captures the total human effort in the company in value

creation. Therefore, HCE is expressed as the amount of value-added generated per money unit invested in employees, derived as:

HCE = VA/HC, where (3)

HCE = human capital efficiency coefficient for the company
VA = value added for the company
HC = total salary and wage duties for the company

The second component of IC, structural capital, is calculated as:

SC = VA - HC, where (4)

SC = structural capital
VA = value added for the company
HC = total salary and wage duties for the company

As equation (4) indicates, the bigger the share of human capital (HC) in the created VA, the smaller the share of structural capital (SC). The efficiency of both HC and SC rises, as the total efficiency of IC increases. Structural capital efficiency (SCE) is therefore calculated as:

SCE = SC/VA, where (5)

SCE = structural capital efficiency coefficient for the company
SC = structural capital
VA = value added for the company

IC efficiency (ICE) is obtained by adding up the partial efficiencies of human and structural capital:

ICE = HCE + SCE, where (6)

ICE = intellectual capital efficiency coefficient
HCE = human capital efficiency coefficient
SCE = structural capital efficiency coefficient

To receive full insight into the efficiency of value creating resources, financial and physical capital must also be taken into account. IC cannot create value on its own. The efficiency of capital employed is calculated as:

CEE = VA/CE, where (7)

CEE = capital employed efficiency coefficient
VA = value added for the company
CE = book value of net assets for the company

Finally, VAIC is obtained by adding HCE, SCE, and CEE:

VAIC = HCE + SCE + CEE = ICE + CEE, where (8)

VAIC = value added intellectual coefficient
HCE = human capital efficiency coefficient
SCE = structural capital efficiency coefficient
CEE = capital employed efficiency coefficient
ICE = intellectual capital efficiency coefficient

2.5 Prior research

Since Pulic developed VAIC to measure the efficiency of value added by IC in the end of the 1990s, several studies have analyzed IC's impact on, and the relationship with, corporate performance. Pulic (2000), studies the relationship between VAIC and the market value of 30 randomly selected companies taken from the London FTSE 250 between 1992 and 1998. In the same paper, 70 companies noted on the Vienna Stock Exchange from 1994 to 1997 are selected and analyzed. The results from these studies show a relationship between VAIC and the market value of companies.

Williams (2001), refines the regression technique, using VAIC as an independent variable and firm size and leverage as control variables, when he investigates IC disclosure practices. Firer and Williams (2003), use this regression technique when they investigate the association between VAIC and three traditional dimensions of corporate performance, among 75 publicly traded companies listed on the Johannesburg Stock Exchange in 2001. As dependent variables, and as proxy measures for corporate performance, the authors use return on assets (profitability), asset turnover (productivity), and the market-to-book ratio (market valuation). Apart from using the aggregate VAIC measure as explaining variable, the individual components comprising VAIC (ICE, SCE, and CEE), are

analyzed individually and used as independent variables. Furthermore, the authors use firm size and leverage and industry type as control variables, which might explain corporate performance. The South African study did not find conclusive evidence of an association between VAIC and corporate performance (table 2.1). Instead of relying on IC as the driver of corporate performance the business environment and market in South Africa still appears to put emphasis on physical assets.

	Significance of VAIC	Sample Size	Period	Industries
Chan (2009)	ROA	156	2001-2005	Several
Shiu (2006)	MB, ROA	80	2003	Technology
Chen et al. (2005)	MB, ROA	4254	1992-2002	Several
Firer & Williams (2003)	None	75	2001	Bank, electronics, information, service

Table 2.1 Summary of prior research

Chen *et al.* (2005), investigate empirically the relationship between IC and firms' market value and financial performance among listed companies in Taiwan between 1992 and 2002. The authors use VAIC and the individual components of VAIC, namely the efficiencies of human capital, structural capital and physical capital, as independent variables. As dependent variables, the market-to-book ratio and four measures of financial performance (return on equity, return on total assets, growth in revenues, and employee productivity) are used. The authors found a relationship between IC and corporate performance (table 2.1), and an even higher degree of association between each component of VAIC, than that of the aggregate measure. That is, as independent variables, the explanatory power of the three VAIC components was greater than VAIC, when analyzed separately. The study provides empirical evidence that investors place higher values on firms with better IC efficiency, and those firms with higher IC efficiency yield greater profitability and revenue growth. Furthermore, the research shows that although traditional accounting standards fails to measure most IC, investors still grasp the invisible value of IC.

In another study, conducted in Taiwan, Shiu (2006) analyzed the correlation between VAIC and corporate performance among 80 technological firms based on 2003 year's annual reports. The author uses the same dependent variables as Firer and Williams (2003), namely, return on assets, asset turnover, and the market-to-book ratio. As independent variables, Shiu (2006) uses VAIC, ICE, SCE, and CEE. The study found a significant positive relationship between VAIC and profitability (ROA) and market valuation (MB) (table 2.1). The author records a

higher degree of explanatory power in the regression models in comparison with Firer and Williams' study. This finding is explained by the higher reliance on IC when creating value in technological firms.

Chan (2009) analyzes the impact of IC on organizational performance within companies listed on the Hong Kong Stock Exchange from 2001 to 2005. The study uses VAIC and its individual components as independent variables, and firm size and leverage as control variables. As dependent variables, Chan uses the market-to-book ratio, return on assets, asset turnover, and return on equity. The author does not find any conclusive evidence to support a definitive association between IC and corporate financial performance, except from a moderate relationship with profitability (table 2.1). Instead of supporting the notion of IC as the driving force behind corporate performance the Hong Kong study finds similar results as Firer and Williams (2003) did in South Africa. That is, physical capital plays a prominent role in enhancing corporate financial performance. In the study, however, Chan found a high level of VAIC among his observations mainly driven by human capital efficiency (table 2.2).

	Independent variables				Dependent variables		
	VAIC	HCE	CEE	SCE	MB	ROA	ATO
Chan (2009)	6.70	5.83	0.16	0.72	2.30	0.08	0.54
Shiu (2006)	1.26	0.62	0.07	0.88	0.00	N/A	N/A
Chen et al. (2005)	5.50	4.63	0.08	0.15	1.96	1.02	N/A
Firer & Williams (2003)	2.24	2.08	0.47	-0.31	1.51	0.16	1.07

Table 2.2 Variables used in prior research

2.5.1 Corporate Performance in prior research

In prior IC research, corporate performance has been defined in several ways (Chan, 2009; Chen *et al*. 2005; Bontis *et al*. 2000; Firer and Williams, 2003; Shiu, 2006). Presently, there is no certain theoretical or empirical evidence supporting any specific proxy measures over another. Therefore, more than one measure is used to capture various dimensions of corporate performance (Firer and Williams, 2003).

The authors, who have investigated the relationship between VAIC and corporate performance, have mostly used similar variables as proxies for corporate performance. However, some minor differences prevail. The following proxies for corporate performance are used in previous research:

- Market-to-book value (MB), which is defined as the ratio of total market capitalization (share price times number of outstanding common shares) to book value of common stocks (Firer and Williams, 2003; Chen *et al*. 2005; Chan, 2009; Shiu, 2006).
- Return on assets (ROA), which is defined as the ratio of operating income to book value of total assets (Firer and Williams, 2003; Chen *et al*. 2005; Chan, 2009; Shiu, 2006).
- Asset turnover (ATO), which is defined as the ratio of total revenue to book value of total assets (Firer and Williams, 2003; Chan, 2009; Shiu, 2006).
- Return on equity (ROE), which is defined as the ratio of net income to total shareholders' equity (Chen *et al*. 2005; Chan, 2009).
- Growth in revenues, which is defined as the percentage change in yearly revenues (Chen *et al*. 2005).
- Employee productivity, which is defined as the ratio of pre-tax income to number of employees (Chen *et al*. 2005).

3 Methodology

The methodology for fulfilling the thesis's purpose is presented in this chapter. The method of research and the procedure for the collection of data are described first. Thereafter, the method of analysis with the regression model and hypotheses are presented. The chapter is concluded with criticism of sources and the chosen methodology.

3.1 Method of research and approach

The purpose of the thesis is to empirically investigate the relationship between intellectual capital (IC) and corporate performance, and to use the estimated models to predict future performance. To fulfill the purpose in a satisfactory way, a deductive approach is chosen, i.e. based on the theories presented above and the chosen sample, relationships (if found) and conclusions (if possible) will be made (Bryman and Bell, 2003). A quantitative research method is found to be the most suitable approach for the thesis, due to the quantitative character of the VAIC measure, and due to the fact that numerous companies will be analyzed. The quantitative approach implies that data will be collected and quantified for later analysis (Bryman and Bell, 2003). The chosen methodology is based on prior studies in the field of IC and corporate performance, in order to ease comparisons between this study and previous research.

3.2 Collection of data

In order to collect data from the chosen companies, the first step in the assembling will be to identify the 100 most traded firms on the Stockholm Stock Exchange, each year over the period between 1998 and 2007. This will be done via historical information from OMX's webpage (www.nasdaqomxnordic.com). After the relevant firms have been identified, accounting and financial data will be collected for these companies and respective year. Primarily, the data will be collected from Thomson DataStream, and secondarily via the firms' annual reports. In comparison to other studies (Chan, 2009; Shiu, 2006; Chen *et al*. 2005; Firer and Williams, 2003) the sample size of 100 companies over 10 years,

i.e. 1000 observations, is the second greatest. A ten-year period is chosen to grasp any variations caused by business cycles and to catch upturns and downturns in the economic markets.

The choice to use the 100 most traded firms has been made to ease the collection of data. The components of the VAIC are not mandatory for a firm to disclose in its annual report and some variables can be difficult to find, especially the further into the past data is gathered. Our choice is based upon the premises to minimize missing values. Firms with a high trade volume are believed to have higher demand from its investors to disclose more information than companies with a lower trade volume.

When data is insufficient for constructing the VAIC measure or any of the measures of corporate performance for a company, these firms will be excluded from the sample. An alternative from removing companies when data is insufficient would be to interpolate the variables missing from its peers. By using an interpolation technique, the risk of using misleading data will increase, why this option is rejected. Moreover, new observations could be added to make up for the missing values but this would be in contradiction with our choice of using the 100 most traded companies. The missing values will be analyzed in connection with the rest of the analysis.

To analyze the differences between industries, the sample will be categorized in accordance with the Global Industry Classification Standard (GICS). Other possible classification schemes could be Standard Industrial Classification (SIC) or International Standard Industrial Classification (ISIC). MSCI in collaboration with Standard & Poor's developed GICS which today has become an industry standard widely used among financial professionals (www.mscibarra.com), among them, OMX Stockholm. The practical use of GICS and its coherence with Stockholm Stock Exchange are the reasons why this standard is chosen for our industry classification.

It is vital that the study would generate the same outcome independent of how many times the research would be done (Bryman and Bell, 2003). The stability in the study is believed to be consistent since all data has been reviewed by accountants before being published in annual reports. The result should therefore not be affected by random and occasional differences in the data used, i.e. the reliability of the study should be high (Bryman and Bell, 2003). In order to determine the quality of the data collected from DataStream, random figures will be compared with annual reports available at company websites.

Since only secondary data will be used, the risk regarding subjectivity is largely limited, and general conclusions should be possible to make as well as comparisons with prior research.

To mitigate risks of mistakes in connection with the collection, all data will be recollected and verified twice. A risk, when comparing this study's findings with research conducted in other countries, is the difference in accounting standards between countries. This risk is difficult to mitigate but the reader should be aware of the problem.

When the data collection is finalized, descriptive statistics will be made in order to get a general view of the sample and to see if any trends in the material can be established.

3.3 Method of analysis

In our thesis, we will use the same definition of IC as Petty and Guthrie (2000), in addition with the workable definition from OECD (1999), where IC is the economic value of two categories of intangibles within the organization, the structural capital and the human capital. Our chosen definition of IC is visualized in figure 3.1.

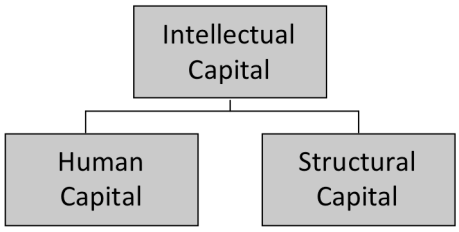

Figure 3.1 Definition of Intellectual Capital

The method chosen is based upon prior research made by Chan, 2009; Shiu, 2006; Chen *et al*. 2005; and Firer and Williams, 2003. The method of analysis is summarized in figure 3.2.

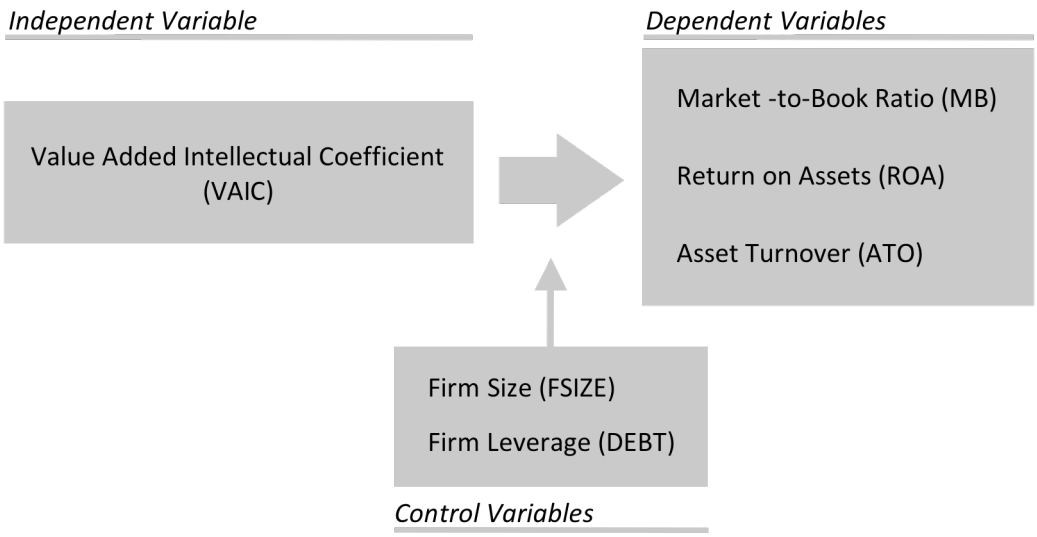

Figure 3.2 Method of analysis

3.3.1 VAIC and Measures of Corporate Performance

The VAIC method is chosen to measure IC. The method's objectivity and its use of financial statements are the main reasons for the choice. Furthermore, as shown in the theory chapter, the VAIC method has gained increased recognition during the latest years and has been used, in several prior studies, when analyzing IC's impact on corporate performance. The VAIC measure for every observation in the sample will be calculated in accordance with the derivation shown in the theory chapter.

To identify a relationship between IC and corporate performance, it is important that what gets measured is the same as what is supposed to get measured, i.e. the thesis must have a high validity (Bryman and Bell, 2003). As the research model is based upon prior research, which has been published in scientific journals, the chosen model, and approach of research have validity from these sources.

As measures of corporate performance, the market-to-book ratio, return on assets, and asset turnover are chosen. According to Firer and Williams (2003), these measures capture three dimensions of corporate performance. That is, market valuation, profitability, and productivity. The choice is based on the fact that these variables are the most frequently used as proxy measures for corporate performance in previous studies. Coherence with previous research will benefit the comparability with our study of the Swedish market in the

analysis, since variables will be defined in a similar fashion. Management's use of these measures for assessing organizational performance is another reason for choosing these variables (Kald and Nilsson, 2000). It is further of importance that the measures work as an indicator of a firms' future performance (Chen *et al*. 2005). However, financial measures can be misleading because they are based on accounting standards. Apart from using financial ratios for evaluating a company's performance, there are other aspects of a firm's business which may be vital for its success. Other measures can be used, such as economic variables or non-financial variables to assess a company's performance. No measure is flawless, and our thesis will not examine in detail which metric is the best to describe corporate performance. For this thesis, corporate performance is equal to ROA, MB, ATO, hence in accordance with prior research.

Furthermore, in line with previous studies, firm size and leverage are included in the study as control variables, often used when analyzing corporate performance. Firm size is defined as the natural logarithm of total market capitalization and firm leverage is defined as total debt divided by the book value of total assets.

3.3.2 The regression model

Regression analysis will be used to investigate the relationship between IC and corporate performance. Regression analysis is concerned with the study of the relationship between one variable and one or more other variables (Guijarati, 2006). Thus, the regression model is the natural choice in order to fulfill the purpose of the thesis. When the analysis demand more than one explanatory variable, a multiple regression model come into use, defined as (Wooldridge, 2003):

$Y_i = \alpha_i + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_i X_i + u_i$, where (1)

Y_i = dependent variable
α_i = intercept
$\beta_1, \beta_2, ..., \beta_i$ = slope coefficients
$X_1, X_2, ..., X_i$ = explanatory variables
u_i = error term

3.3.2.1 Panel regression

Since the collected data will have both cross-sectional and time series dimensions, a panel data regression model is suitable to analyze the relationship between IC and corporate performance. This model can be defined as (Wooldridge, 2003):

$Y_{it} = \alpha_i + \beta_1 X_{it1} + \beta_2 X_{it2} + ... + \beta_k X_{itk} + u_{it}$, where (2)

Y_{it} = dependent variable
α_i = intercept, unobserved effects
$\beta_1, \beta_2, ..., \beta_k$ = slope coefficients
$X_{it1}, X_{it2}, ..., X_{itk}$ = explanatory variables
u_{it} = error term
i = company observation
t = time period

A fixed effects panel regression will be used, since the correlation between the unobserved effects, α_i, and the explanatory variables, $X_{it1}, X_{it2}, ..., X_{itk}$, is unknown and hard to predict. Furthermore, a fixed effects model is recommended for a sample with a large number of *i* and a relatively small number of *t* (Wooldridge, 2003). The model will be estimated by using the sample between 1998 and 2006. All regressions will be performed in the econometric data software Eviews.

3.3.2.2 Analysis of industries

Apart from conducting panel data regressions on the whole sample between 1998 and 2006, each industry (classified by GICS) will be analyzed separately. The same panel data regression models used on the whole sample will be used on each individual industry. However, each regression will be estimated using the data for the entire sample period, i.e. 1998 to 2007. This is done because several of the industries are likely to contain a limited number of observations and our aim with the prediction models are to get as valid and applicable models as possible. The industry analysis will be conducted with the ambition to investigate whether IC is more important for corporate performance in some industries than others.

3.3.2.3 Models of prediction

The collected data for the last year in the sample period, i.e. the data for 2007, will be used to validate the estimated models ability to predict corporate performance. Hence, the actual values of the explanatory variables will be inserted into the estimated regression models to get an estimate of the market-to-book ratio, return on assets, and asset turnover respectively. The estimates will then be compared to the actual values of the corporate performance measures for all companies in 2007.

A 95 percent confidence interval will be conducted around the true value. An estimate which lies within the interval will be classified as a good prediction. While an estimate which lies outside the interval will be classified as a failed prediction. The prediction models are conducted with the aim to create tools for assessing corporate performance, by identifying the company's IC (measured with VAIC) for investors and other parties. The prediction models might ease valuation of companies with a high portion of IC.

3.3.2.4 Multicollinearity and analysis of residuals

When the explanatory variables in the regression model are extended to include more variables than simply the VAIC measure, the risk of multicollinearity is present. Multicollinearity, defined as linear relationships among explanatory variables, meaning difficulties when interpreting the individual explanatory variables impact on the dependent variable (Guijarati, 2006). A large sample might control for the problem of multicollinearity, hence a large sample will be collected. A correlation matrix will be used to examine the relationship between the explanatory variables.

Two of the assumptions supporting the regression model, claim that the residuals (error terms) should be normally distributed and have constant variance. These assumptions are needed to make inference possible. The central limit theorem, says that the residuals are approximately normally distributed if the sample is large (Guijarati, 2006). Histograms of the residuals will be used to verify that the residuals are normally distributed. The second assumption about the residuals being homoscedastic, i.e. have constant variance, will be controlled for and corrected with White's test (Guijarati, 2006). All tests will be conducted in Eviews.

3.3.3 Hypotheses

In order to be able to make any general conclusions regarding the relationship between IC and corporate performance, hypotheses for the slope coefficients are designed. The general hypothesis for the analysis will be:

H_0: the variable is not explaining (i.e. do not have a relationship with) corporate performance
H_1: the variable is explaining (i.e. do have a relationship with) corporate performance

More formally, the hypotheses for any given slope coefficient will be:

H_0: $\beta_i = 0$
$H_{1:}$ $\beta_i \neq 0$

To be able to investigate the significance of the relationship, the estimated β-values will be analyzed on a level of significance of 95 percent. The exact significance level, i.e. the p-value, will be used when determine whether an explaining variable is significant or not. Thus, a p-value ≤ 0.05 will be used as the threshold level for deciding on a variable's significance. A significance ≤ 0.05 will be indicated by one star (*), a level ≤ 0.01 will be indicated by two stars (**), and finally a significance level ≤ 0.001 will be indicated by three stars (***). R^2 or the coefficient of determination will be used to evaluate how big portion of the total variation in the dependent variable that is explained by the regression models.

The research hypotheses, proposed to examine the relationship between VAIC and the three measures of corporate performance, which the analysis will build upon, are:

H1a: Companies with higher VAIC have higher market-to-book ratios
H1b: Companies with higher VAIC have higher return on asset
H1c: Companies with higher VAIC have higher asset turnover

These hypotheses are the base for the analysis of the relationship between IC (measured with VAIC) and corporate performance (measured as MB, ROA, and ATO).

3.4 Data and criticism of sources

Secondary sources will be used throughout the thesis. No primary data, i.e. interviews and observations are used. Important to bear in mind, is the topic's fairly infant stage of development, why the value of a few theories about IC can lack empirical testing. In addition, it is important to mention the comparatively limited group of scholars in the area of IC. A few names are very common as authors and opinion makers. In the data gathering, DataStream and annual report are the main sources. These sources are believed to be reliable. However, DataStream occasionally reclassify data before making it accessible and this process is not guaranteed to be flawless. This kind of wrongly audited information is a hard task to overcome. As mentioned before, this risk should be mitigated by comparing the data with figures gathered from annual reports. The annual reports are believed to be an even more reliable source, since those financial statements have been audited by independent accountants.

The original article will be used to present a theory. Reiterations or summaries of theories, which can be found in text-books, will be used to a minimum in order to recap a theory or model as correct as possible. The resources used will mainly be scientific publications, such as the Journal of Intellectual Capital. The Journal of Intellectual Capital is believed to be the most reliable publication regarding the topic IC, since the most quoted authors are referred in this publication. For further information about various models and theories and in the absence of publicized articles, authors' websites will be used. Articles taken from websites lack the trustworthiness of articles published in scientific journals, where they are examined and reviewed before publishing.

3.5 Methodological criticism

The choice of using regression analysis to investigate the relationship between IC and corporate performance is reasonable. However, if the chosen models are correct is a subjective matter. Coherence with earlier published research will hopefully imply a good model. The R^2 value will be used to assess the models fit. A similar reasoning applies for the choice of variables used as proxy measures for corporate performance and VAIC as a proxy measure of IC. Both corporate performance and IC are fuzzy conceptions hard to quantify and measure. As shown in the theory chapter, there are several methods of measuring IC. However, it is argued that the chosen measures will provide the best

opportunity to fulfill the purpose of the thesis, and make comparisons with other studies possible.

4 Empirical Results

In this section, the empirical results are shown. The sample is first presented by industry and followed by descriptive statistics of key variables. The chapter ends with the development of the different measures over the sample period and with the variables categorized by industry.

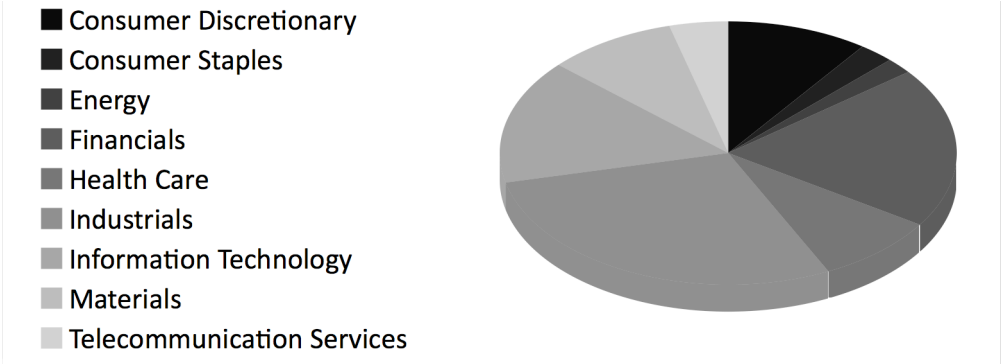

Figure 4.1 Observations by industry

The ambition has been to gather information of the 100 most traded companies on the Stockholm Stock Exchange, over a period of ten years (1998-2007). Missing values, due to acquisitions, foreign ownership, and lack of data, have resulted in a sample of 823 observations. The included observations are shown in appendix 1. By using Standard & Poor's classification standard GICS, the sample has been categorized into nine industries. As seen in figure 4.1, industrials are the dominating group (28.4%), followed by financials (19.9%). The third largest group is information technology (15.3%), while the other groups make up the remaining 36.50 percent. Over time, the categories have been fairly stable with the exception of information technology with its peak in year 2000, with 22 observations and with starting and ending values of 8 observations (exhibit 1 in appendix 2).

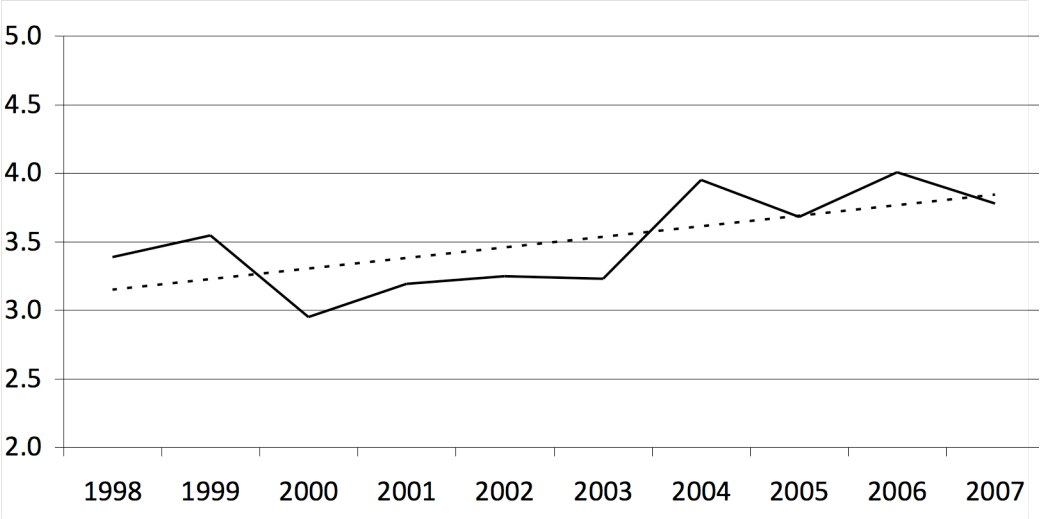

Figure 4.2 VAIC of sample per year

In figure 4.2, the VAIC, solid line, is visualized with the trend line, dotted line. The line is indicating an upward sloping trend over time, implying that the efficiency of value added by corporate intellectual capital has increased over the sample period. The yearly mean VAIC fluctuated over the period between 2.95 to 4.01.

	VAIC	MB	ROA	ATO
Mean	3.5090	3.1660	0.0540	0.9780
Maximum	19.8930	28.3780	0.4500	4.8340
Minimum	-30.9280	0.0620	-1.9310	-0.0470
Std. Deviation	2.7480	3.2320	0.1740	0.6900

Table 4.1 Descriptive statistics of variables

The mean VAIC in the sample was 3.51 (table 4.1). The overall efficiency of IC in the sample has been volatile with values ranging from -30.93 to 19.89. The mean market-to-book ratio in the sample was 3.17. This indicates, during our sample period, that only 31.70 percent of the market value is shown in the books. The maximum and minimum value in the sample has a wide spread with values ranging from 0.06 to 28.28. The average return on assets in our study generated a relatively small value of 5.40 percent. The ROA is supposed to indicate the firms' profitability when utilizing total assets, when the firms' financing policy is held constant. As seen, the profitability has been quite low in our sample, although, the fluctuations in this variable have been significant, with a maximum value of 45.00 percent, compared to the minimum value of a negative 193.10 percent. The mean asset turnover in the sample was 0.98 times, which indicates that the productivity of total revenues to total book value has

been low. The investments have almost generated revenues equal the cost of acquiring those assets, which implies low efficiency among the sample companies. This is the only dependent variable in our sample which generates a greater mean value than the standard deviation.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
MB	3.15	3.28	4.11	3.01	2.01	2.50	2.81	3.32	3.79	3.70
ROA	0.06	0.07	-0.01	-0.03	0.04	0.04	0.06	0.09	0.11	0.10
ATO	1.09	1.07	0.82	0.92	0.97	0.96	1.06	0.95	1.00	0.95

Table 4.2 Descriptive statistics of dependent variables per year (mean)

In table 4.2, a fairly stable market-to-book value during the period is found. The highest value found was 4.11, compared to the smallest 2.01. The downturn in the economic markets during the first years of the 21st century resulted in negative average return on assets among the sample companies. The asset turnover has fluctuated around one during the sample period. The investments have almost in half of the years generated revenues which were greater than the cost of acquiring those assets.

	VAIC	MB	ROA	ATO
Consumer Discr.	3.5240	4.4830	0.1440	1.5620
Consumer Staples	3.9010	6.3780	0.1460	2.2600
Energy	8.4930	2.4020	0.0900	0.3390
Financials	4.7040	1.8070	0.0310	0.2850
Health Care	2.4190	4.0680	0.0380	0.7380
Industrials	3.1680	2.3100	0.0740	1.2160
Info. Technology	2.7760	5.4420	-0.0390	1.1170
Materials	3.0330	1.4640	0.0790	0.9170
Telecom. Services	3.6690	4.0640	0.0450	0.8220

Table 4.3 Descriptive statistics of variables per industry

Energy is the industry with the highest VAIC in the sample, while financials has the second highest. However, the energy sector has only 15 observations and the result might be ambiguous. Industrials are close to our total average VAIC, while telecom services are slightly higher. Health care and information technology are the two industries with lowest VAIC. This finding is somewhat surprising, since IC ought to play an important role for value creation in these two industries. Further, materials have the lowest market-to-book ratio and consumer staples the highest. A low MB in materials and financials is logical, since the books should be able to reflect the true value of these firms with higher precision than in industries such as health care and information

technology, where companies have higher portions of hidden values not recognized in the books. Return on assets and asset turnover are highest in consumer staples and consumer discretionary. A high asset turnover in these industries is reasonable since the products are consumables. Information technology has a negative average ROA during the sample period, probably due to the uncertainty in this industry. Energy and financials have the lowest asset turnover, which is logical when considering the firms' products and businesses.

5 Analysis

The analysis of the collected observations is presented in this chapter. Initially are the results from the analysis of the total sample described. Next is each industry investigated separately and the section concludes with the prediction models of corporate performance.

5.1 Analysis of total sample

5.1.1 The basic panel regression models

In the basic panel regression models which are used to investigate the relationship between intellectual capital (IC) and corporate performance, VAIC is used as the only explanatory variable. As dependent variables the market-to-book ratio, return on assets, and asset turnover are used in three different regressions. The three different models are defined as:

$$MB_{it} = \alpha_i + \beta * VAIC_{it} + u_{it} \quad (1)$$

$$ROA_{it} = \alpha_i + \beta * VAIC_{it} + u_{it} \quad (2)$$

$$ATO_{it} = \alpha_i + \beta * VAIC_{it} + u_{it}, \text{ where} \quad (3)$$

MB_{it} = the market-to-book ratio for company i in time t
ROA_{it} = return on assets for company i in time t
ATO_{it} = asset turnover for company i in time t
α_i = intercept
$VAIC_{it}$ = the value added intellectual coefficient for company i in time t
u_{it} = error term

The three models are estimated, using data for 731 observations between 1998 and 2006. Total cross-sections amount to 178, implying that 178 different companies are included and used one to nine times, depending on whether the company actually was among the 100 most traded firms that particular year and on data availability. Total pool observations amount to 130,118 (731

observations x 178 cross-sections). Heteroscedasticity is controlled for by using White's cross-section standard errors. The results for the three basic panel regression models are shown in table 5.1.

MB	Coefficient	Std. Error	t-Statistic	P-value
Intercept	3.1026	0.1739	17.8406	0.0000
VAIC	0.0000	0.0446	0.0016	0.9987
R^2	*0.0000*	*Cross-sections*		*178*
Observations	*731*	*Total pool obs.*		*130118*

ROA	Coefficient	Std. Error	t-Statistic	P-value
Intercept	-0.0049	0.0155	-0.3161	0.7519
VAIC	0.0154	0.0037	4.1264	0.0000
R^2	*0.0428*	*Cross-sections*		*178*
Observations	*731*	*Total pool obs.*		*130118*

ATO	Coefficient	Std. Error	t-Statistic	P-value
Intercept	1.0723	0.0457	23.4730	0.0000
VAIC	-0.0260	0.0116	-2.2512	0.0244
R^2	*0.0083*	*Cross-sections*		*178*
Observations	*731*	*Total pool obs.*		*130118*

Table 5.1 Panel regressions with VAIC as only explanatory variable

Of the three regression models, it is only the relation between VAIC and ROA which confirms our hypothesis (H1b). This positive relationship is statistically significant (***). In contrast to hypothesis (H1c), the relationship between ATO and VAIC is negative and significant (*). The regression model fails to find any significant relationship between MB and VAIC. The R^2-values for all three regressions are low. However this is not surprising, since corporate performance is likely to be influenced and explained by numerous factors and not only by IC.

The positive relationship between ROA, which is used as a measure of profitability, and VAIC is in coherence with Chen *et al.* (2005), Shiu (2006), and Chan (2009). In contrast to previous research (Shiu 2006; Chen *et al.* 2005), no positive association between MB and VAIC could be found. Neither our results nor previous research, which we have investigated, have found any significant positive relationship between ATO and VAIC. ATO is in a sense already controlled for when using ROA as a proxy measure for corporate performance, since asset turnover is a part of return on assets (asset turnover x profit margin = return on assets). Other models such as the Technology Broker and the Value

Explorer could be more sufficient to estimate productivity. Andriessen (2005) stresses the importance of identifying core competencies, with the Value Explorer, such as a high ATO.

5.1.2 The extended panel regression models

In the next step of the analysis, firm size and leverage are included as control variables, often used when analyzing corporate performance. The ambition is to get models which have the ability to predict corporate performance, as measured with the three proxy measures. The correlation matrix for the VAIC and firm size and leverage is shown in appendix 2, exhibit 2. As shown, the correlation between the three variables is low, thus the risk for multicollinearity is considered low. The extended panel regression models are defined as:

$$MB_{it} = \alpha_i + \beta_1 * VAIC_{it} + \beta_2 * FSIZE_{it} + \beta_3 * DEBT_{it} + u_{it} \quad (1)$$

$$ROA_{it} = \alpha_i + \beta_1 * VAIC_{it} + \beta_2 * FSIZE_{it} + \beta_3 * DEBT_{it} + u_{it} \quad (2)$$

$$ATO_{it} = \alpha_i + \beta_1 * VAIC_{it} + \beta_2 * FSIZE_{it} + \beta_3 * DEBT_{it} + u_{it} \quad (3)$$

MB_{it} = the market-to-book ratio for company i in time t
ROA_{it} = return on assets for company i in time t
ATO_{it} = asset turnover for company i in time t
α_i = intercept
$VAIC_{it}$ = the value added intellectual coefficient for company i in time t
$FSIZE_{it}$ = natural logarithm of market capitalization for company i in time t
$DEBT_{it}$ = total debt divided by book value of total assets for company i in time t
u_{it} = error term

The results of the regressions with control variables are shown in table 5.2.

MB	Coefficient	Std. Error	t-Statistic	P-value
Intercept	-1.1226	1.3513	-0.8307	0.4061
VAIC	0.1172	0.0489	2.3960	0.0166
FSIZE	0.7672	0.2014	3.8098	0.0001
DEBT	-6.3301	0.7111	-8.9012	0.0000
R^2	*0.1306*	*Cross-sections*		*178*
Observations	*731*	*Total pool obs.*		*130118*

ROA	Coefficient	Std. Error	t-Statistic	P-value
Intercept	-0.4961	0.1057	-4.6937	0.0000
VAIC	0.0152	0.0037	4.1024	0.0000
FSIZE	0.0736	0.0141	5.2232	0.0000
DEBT	-0.0795	0.0390	-2.0354	0.0418
R^2	*0.1212*	*Cross-sections*		*178*
Observations	*731.0000*	*Total pool obs.*		*130118*

ATO	Coefficient	Std. Error	t-Statistic	P-value
Intercept	2.3004	0.2243	10.2570	0.0000
VAIC	0.0084	0.0116	0.7260	0.4679
FSIZE	-0.1456	0.0315	-4.6196	0.0000
DEBT	-1.4252	0.1414	-10.0809	0.0000
R^2	*0.149*			*178*
Observations	*731.0000*			*130118*

Table 5.2 Panel regressions when controlling for firm size and leverage

The association between VAIC and ROA is still positive and significant (***) when controlling for firm size and leverage, which both explain ROA significantly. The positive relationship between FSIZE and ROA implies that the larger the firms, the higher return on assets. The negative relationship between DEBT and ROA indicates that firms with high leverage have lower return on assets.

When including firm size and leverage, VAIC gets a significant positive relationship (**) with MB. Hence, hypothesis (H1a) is confirmed when control variables are included in the regression. Both FSIZE and DEBT have significant association with MB and the relationships can be interpreted in a similar way as for ROA.

VAIC fails to enter the extended regression model with any significance when testing the relationship with ATO. However, in contrast to the basic model, the relationship is now positive. Both control variables are significant. FSIZE (***) has a negative relationship with ATO, implying that the larger the firm, the lower asset turnover. DEBT (***) has also a negative association, meaning the higher the leverage, the lower the asset turnover.

The R^2-values for all three models are considerably higher than for the three basic models. These results are logical since corporate performance is explained

by numerous factors, whereof firm size and leverage often are included. The three estimated models with included control variables will form the foundation for the prediction models presented later in this chapter.

5.1.3 Analysis and implications of missing values

The intended sample size was 1000 observation (100 observations per year over 10 years). Due to lack of data, the total sample amount to 823 observations, i.e. 177 observations are excluded from the analysis because of missing values. Failure of disclosing the cost of human capital (needed to compute the VAIC), is the most common reason for exclusion. Other reasons for missing values are corporate actions, such as acquisitions and delistings, and foreign ownership. The missing values sorted by year and industry, are shown in appendix 2, exhibit 3. The portion of missing values increases further back in the sample period, with only nine missing observation in 2007 compared to 28 in 1998. Financials and industrials are the two largest industries in the sample and it is also within these industries where the largest amounts of missing values occur.

The implication of missing values might be a skewed sample. It is however difficult to establish any systematic pattern among the missing values. Hence, any skewness is likely to be random and will not affect the sample and the results in any distinct way.

5.2 Analysis by industry

The next step in the analysis is to investigate if IC plays a more prominent role for corporate performance in some industries, than it does in others. The total sample is categorized, according to GICS, into nine industries as shown in the empirical chapter. Similar panel regression models which were used in the analysis of the total sample are used for each individual industry. The industries are analyzed for the period 1998-2007. The result for the different regression models are shown in appendix 2, exhibit 4. In table 5.3, the most important findings are highlighted for the regression models with VAIC as the only explanatory variable.

MB	Intercept	VAIC	R^2	Obs.
Consumer discretionary	1.2133	0.9367***	0.1644	82
Consumer staples	-16.9932	5.9913	0.8202	22
Energy	1.2873	0.1312	0.1615	15
Financials	2.0353***	-0.0388	0.0196	163
Health care	4.0080***	0.0250	0.0003	71
Industrials	0.5230	0.5671***	0.1722	234
Information technology	4.6357***	0.2906	0.0131	126
Materials	-0.344	0.5963***	0.3074	75
Telecommunication services	0.6531	0.9297	0.1404	35

ROA	Intercept	VAIC	R^2	Obs.
Consumer discretionary	0.047334	0.0277	0.1242	82
Consumer staples	-0.1664*	0.0802	0.5760	22
Energy	-0.1094	0.0119	0.5279	15
Financials	0.0173***	0.0029***	0.1200	163
Health care	-0.1938**	0.0960***	0.5177	71
Industrials	0.0675**	0.0023	0.0027	234
Information technology	-0.1637*	0.0448	0.0563	126
Materials	-0.1513***	0.0760***	0.7584	75
Telecommunication services	-0.1301	0.0478	0.5200	35

ATO	Intercept	VAIC	R^2	Obs.
Consumer discretionary	1.8296	-0.0740*	0.0282	82
Consumer staples	2.7508	-0.1259	0.8202	22
Energy	0.3505	-0.0014	0.0018	15
Financials	0.3383***	-0.0113	0.0187	163
Health care	0.5166***	0.0915***	0.3538	71
Industrials	0.7980	0.1333	0.1084	234
Information technology	0.6994***	0.1505***	0.3267	126
Materials	0.5959***	0.1058	0.0639	75
Telecommunication services	0.7881	0.0093	0.0021	35

Table 5.3 Panel regressions by industry with VAIC as only explanatory variable

VAIC enters the regressions with a positive sign for all industries except financials, when investigating the association with MB. However, the positive relationship is only significant for consumer discretionary, industrials, and materials. VAIC's strong significance for the market-to-book ratio among firms in industrials and materials shows that IC plays a prominent role for this dimension of corporate performance within these industries. These findings are interesting,

considering the large amount of physical capital used in these industries, when according to our findings IC is a large part of the companies' market valuations. The small amount of observations for consumer staples, energy, and telecommunication services, make it difficult to conduct statistically reliable inference of the results for these industries.

The relationship between VAIC and ROA is positive for all industries and significant for financials, health care, and materials. The positive association between VAIC and ROA in all industries, points out the importance of IC for corporate profitability, which return on assets, is a proxy measure of. The significant relationships show that IC is vital for profitability in a wide range of industries, from energy and materials to health care and financials. The results indicate that IC is important for corporate performance in both industries which rely on a high level of R&D such as health care, and in industries which are more dominated by physical assets such as energy and materials.

The association between VAIC and ATO is more varied. For consumer discretionary, consumer staples, energy, and financials the relation is negative, while the association is positive for health care, industrials, information technology, materials, and telecommunication services. The positive significant relationship between VAIC and ATO in the health care and information technology sector might be interpreted as IC's important role for productivity in these industries. Both sectors productivity relies heavily on inventions and new products, which a high level of IC vouches for.

None of the industries show a significant positive relationship between VAIC and all three measures of corporate performance. Health care (ROA and ATO) and materials (MB and ROA) both have significant association with two of the three dimensions. Hence, IC is important for corporate performance in industries with different structures and characters.

The entire results for the panel regression models, where firm size and leverage are included as control variables, are found in appendix 2, exhibit 5. In table 5.4 are the results summarized.

The association between VAIC and MB continues to be positive for all industries, this time with exception for health care. The relation is statistically significant for consumer discretionary, materials, and industrials. Consumer staples and telecommunication services contain, as mentioned above, too few observations for making reliable conclusions possible.

MB	Intercept	VAIC	FSIZE	DEBT	R^2
Consumer discr.	-11.8808*	1.001***	1.9660*	-4.5039*	0.3324
Consumer staples	-18.9565	5.9721	0.2718	0.5371	0.8211
Energy	-7.1320	0.1016	1.3373	-2.7636	0.3103
Financials	-0.2772	0.0018	0.4092***	-2.2461***	0.1816
Health care	-5.0062	-0.0100	1.4869*	-6.1660***	0.1977
Industrials	-4.5240***	0.5958***	0.7693***	-1.5978*	0.2682
Information tech.	-7.7617*	0.3477	2.0324***	-10.1620**	0.1999
Materials	3.1854**	0.6925***	-0.5510**	0.0297	0.3880
Telecom. services	18.1894	1.8632	-3.2234	12.5615	0.3188

ROA	Intercept	VAIC	FSIZE	DEBT	R^2
Consumer discr.	-0.2041	0.0255	0.0368*	-0.1167*	0.2619
Consumer staples	0.1009	0.0817	-0.0370	-0.0587	0.6373
Energy	-0.5226	0.0120	0.0712	0.0802	0.7489
Financials	0.1096**	0.0037***	-0.0096*	-0.0706***	0.2584
Health care	-0.8162**	0.0866***	0.0991*	-0.1863	0.5694
Industrials	-0.0676	0.0030	0.0206***	-0.0430	0.0706
Information tech.	-1.0810***	0.0415	0.1413***	-0.0605	0.1648
Materials	-0.1132**	0.0797***	-0.0015	-0.1598***	0.8237
Telecom. services	-0.2699	0.0414	0.0235	-0.0302	0.5332

ATO	Intercept	VAIC	FSIZE	DEBT	R^2
Consumer discr.	3.1782**	-0.0511	-0.1295	-2.5584***	0.2875
Consumer staples	5.2126	0.4654	-0.3297	-8.6542	0.6486
Energy	-0.8190	-0.0028	0.1708	-0.0142	0.2411
Financials	2.5050***	-0.0060	-0.2627***	-0.7866***	0.3277
Health care	0.9055*	0.1065***	-0.0573	-0.1983	0.3733
Industrials	2.4695***	0.1592***	-0.1806***	-1.8523***	0.4072
Information tech.	0.5008	0.1530***	0.0345	-0.3088	0.3353
Materials	2.9285***	0.1784**	-0.3492***	-0.5211*	0.3040
Telecom. services	3.0776	0.1018	-0.355	-0.4106	0.4705

Table 5.4 Panel regressions by industry when controlling for firm size and leverage

The firm's size enters the regression with a positive sign for all industries, except materials and telecommunication services. Firm leverage is negatively related to the market-to-book ratio for all industries but consumer staples, materials, and telecommunication services.

VAIC is positively associated with ROA in all industries when controlling for firm size and leverage. Financials, health care, and materials show a statistically significant relationship. FSIZE is negatively related to ROA for consumer staples, financials, and materials, while the relationship is positive for the other industries. DEBT is negatively associated with ROA for all industries except energy.

The relationship between VAIC and ATO in the extended model varies between industries. The association is positive for consumer staples, health care, industrials, information technology, materials, and telecommunication services. For consumer discretionary, energy, and financials the relationship is negative. The relation between firm size and asset turnover is negative for all industries but energy and information technology. Firm leverage is negatively related to asset turnover for all industries.

The extended models confirm the finding, that IC is important for corporate performance in industries with different characters and features. It is hard to distinguish one or two industries, where IC is more important for performance, than in the other industries. However, materials have positive and significant associations between VAIC and all three measures of corporate performance in the extended models. Industrials and health care have significant positive relationships with two of the three measures. The two control variables show several significant relationships. Firm size is in most cases positively related to the market-to-book ratio and returns on assets, implying that the bigger the firm, the higher market valuation and profitability. The third measure, asset turnover, has in most cases a negative relationship with the firm's size, meaning the bigger the firm, the lower the productivity. Firm leverage is not surprisingly negatively related to all three measures of corporate performance in the majority of industries.

Different industries might be suitable to analyze with different methods of measuring IC. As argued for, VAIC's objectivity and possibilities for generalization make the measure superior for the purpose of the thesis. To get further insights about IC in a particular industry, other measures than VAIC might be used. Tobin's Q or FiMIAM could be used when analyzing industries such as materials and energy. The values of companies in these industries are closely related to the natural resources they possess and replacement costs of these resources are often easily available at the market. For industries such as health care and information technology, where the companies' value creation rely on R&D and new patents and products, possible methods might be the

Citation-Weighted Patent method or the Intangible Asset Monitor approach. Furthermore, the Scorecard (SC) and the Direct Intellectual Capital (DIC) approaches may be the most suitable methods for an in-depth-analysis of a company's IC. For example, might the Skandia Navigator or the Technology Broker explain the relationship between IC and MB better than VAIC.

5.3 Prediction models

The last step in the analysis is to verify the estimated models, by using them to predict the three dimensions of corporate performance for the sample companies in 2007. The market-to-book ratio, return on assets, and asset turnover are predicted for a total of 91 companies, using the extended models. That is corporate performance, is predicted with VAIC, firm size and leverage. The estimates are then compared with the actual values for the 91 companies. An estimate is classified as good if it lies within one standard deviation from the true value, i.e. a 95 percent confidence interval is conducted around the true value.

The total result is shown in appendix 2, exhibit 6. In table 5.5, the result of the classification is shown.

	Good	Bad	Total
MB	3	88	91
ROA	5	86	91
ATO	6	85	91
Total	14	259	273
Percentage	*5.13*	*94.87*	*100.00*

Table 5.5 Classification according to the prediction models

A mere 5.13 percent of the models predictions are classified as good. These results are however not very surprising considering the amount of factors which are likely to influence corporate performance and are not included in the models. For the models to be more accurate, more explaining variables need to be included.

Although, the models are not able to predict future corporate performance in a satisfying way, the conducted tests and investigations provide several important findings. The positive relationships found between VAIC and corporate

performance, indicate the importance of IC for company's value creation. Hence, as this study shows, VAIC is not the only factor explaining corporate performance but still an important one. Investors trying to value a company should therefore assess and investigate the company's level of IC and include this in the valuation process. As this study shows, one way of doing this is to calculate the VAIC for the company and use this as a proxy measure of IC. The VAIC measure should then be included as one of the factors explaining corporate performance, which forms the foundation for the investors' valuation.

As mentioned before, there are several other methods for measuring IC. VAIC as a predictor model appears to be shallow and the mistake by only assuming that the tree consists of visible parts, such as financial statements, can be made. A qualitative model might be more suitable for an investor to use. It is about digging below the surface to examine the level of nutrition in the roots to predict the tree's future growth. VAIC is a quantitative approach, suitable to assess the IC of a group of companies or industries. Whereas, the scorecard approaches, such as the Asset Monitor, the IC-index or the Skandia Navigator, may be more appropriate as an investment tool. However, the qualitative approaches are more detailed, hence time consuming and sometimes unfeasible for an external part why VAIC or other methods may be the only option.

6 Conclusions

In this final chapter, the conclusions from the analysis are presented. Further, are the research questions answered and lastly are suggestions for further research brought forward.

6.1 Conclusions

Over our sample period between 1998 and 2007, we have analyzed the relationship between intellectual capital (IC) and corporate performance for 823 observations. 721 of these (the observations from 1998 to 2006), were used in panel regressions to estimate models and remaining observations (the companies in 2007), were used to verify the models ability to predict corporate performance. In addition, the sample was divided into nine industries which were analyzed separately.

There is a significant positive relationship between IC (measured with VAIC) and profitability (measured with return on assets), confirming hypothesis (H1b). This means that companies with high VAIC have higher profitability. When controlling for firm size and leverage, there is a significant positive relationship between IC and market valuation (measured with the market-to-book ratio). This confirms hypothesis (H1a), meaning that companies with high VAIC have higher market valuation. Productivity (measured with asset turnover), is the third dimension of corporate performance which is analyzed. No positive relationship is however found with IC, i.e. hypothesis (H1c) is not verified.

IC is important for corporate performance in industries with different structures and characters, from materials to health care. It is not possible to single out any particular industry where IC should be especially important for corporate performance. The conclusion is instead that IC is vital for the value creation in a wide range of industries. Furthermore, IC is only valuable when put in the right context. IC is individual and will always play different roles dependent in what environment it is identified. For a company to possess IC, which can be considered valuable, there has to be a fit with its physical capital and its business model.

The estimated models ability to predict future corporate performance is low. Not surprisingly are factors as the market-to-book ratio, return on assets, and asset turnover influenced and explained by more than VAIC, firm size, and firm leverage, which we use in our prediction. The important conclusion is that intellectual capital does not fully explain corporate performance, but is one of many factors doing it. VAIC could therefore be included as a proxy for intellectual capital in models investigating or predicting corporate performance. This is an important implication for investors valuing companies.

6.2 Future research

The interest for and research of IC has been growing over the latest decades. This study use a quantitative method (VAIC) to measure IC and three proxy measures (MB, ROA, ATO) for corporate performance. One way to develop the study could be to use the three components of VAIC (HCE, SCE, and CEE) and analyze these separately, to investigate which one of the efficiency ratios are the most important for corporate performance. Other measures of corporate performance, with other aspects than financial, are one direction in which the research can develop. The industry analysis can be deepened by investigating only a few of the industries with one of the more qualitative approaches of measuring IC presented in the theory chapter.

The sample period might be extended to include earlier observations to investigate IC's importance for corporate performance over time. Less traded companies might also be included in the sample to analyze more than 100 companies each year. However, these extensions increase the risk for missing values. Related industries could also be merged into larger groups to make inference possible for industries with few observations. The model for predicting corporate performance is another area for future research, trying to find more factors to include increasing the models ability to predict future performance.

References

Allee, V. (1997), "*The Knowledge Evolution, Expanding Organizational Intelligence*", Butterworth-Heinemann, Boston, MA.

Andriessen, D. (2001),"Weightless Wealth: Four modifications to standard IC theory", *Journal of Intellectual Capital*, Vol. 2 No. 3, pp. 202-214.

Andriessen, D. (2004a), "IC valuation and measurement: classifying the state of the art", *Journal of Intellectual Capital*, Vol. 5 No. 2, pp. 230-242.

Andriessen, D. (2004b), *"Making sense of intellectual capital – Designing a* method for the valuation of intangibles", Elsevier

Andriessen, D. (2005): "Implementing the KPMG value explorer: Critical success factors for applying IC measurement tools", *Journal of Intellectual Capital*, Vol. 6 No. 4, pp. 474- 488.

Andriessen, D., (2006), "On the metaphorical nature of intellectual capital: a textual analysis", *Journal of Intellectual Capital*, Vol. 7 No. 1, pp. 93-110.

Annell, E. Sveiby, K. E. (1989), "Den osynliga balansräkningen: nyckeltal för redovisning, styrning och värdering av kunskapsföretag", Stockholm Affärsvärlden, 2nd edition.

Barney, J.B. (1991), "Firm resources and sustainable competitive advantage", *Journal of Management*, Vol.17 No. 1, pp. 99-120.

Bontis, N. (1999), ``Managing organizational knowledge by diagnosing intellectual capital: framing and advancing the state of the field'', *International Journal of Technology Management*, Vol. 18 No. 5-8, pp. 433-62.

Bontis, N., Dragonetti, N., Jacobsen, K. and Roos, G. (1999), "The knowledge toolbox: a review of the tools available to measure and manage intangible resources", *European Management Journal*, Vol. 17 No. 4, pp. 391-402.

Bontis, N., Chua, W., Keow, C. and Richardson, S. (2000), "Intellectual capital and business performance in Malaysian industries", *Journal of Intellectual Capital*, Vol. 1 No. 1, pp. 85-100.

Bontis, N. (2001), "Assessing knowledge assets: a review of the models used to measure intellectual capital", *International Journal of Management Reviews*, Vol. 3 No. 1, pp. 41–60.

Boisot, M. H. (1999), "*Knowledge Assets: Securing Competitive Advantage in the Information Economy*", Oxford University Press, Oxford.

Bozbura, F.T. (2004), "Measurement and application of intellectual capital in Turkey", *The Learning Organization*, Vol. 11 No. 4-5, pp. 357-67

Brennan, N. (2001), "Reporting intellectual capital in annual reports: evidence from Ireland", *Accounting, Auditing and Accountability Journal*, Vol. 14 No. 4, pp. 423-37

Brooking, A. (1996), "Intellectual Capital: Core Assets for the Third Millennium Enterprise", *International Thompson Business Press*, New York.

Brown, D.M. Laverick, S. (1994), "Measuring Corporate Performance", *Long Range Planning*, Vol. 27, No. 4, pp. 89-98.

Bryman, A. Bell, E. (2003), "Business Research Methods", *Oxford University Press*

Bukh, P.N. Larsen, H.T. Mouritsen, J. (1999), ``Developing intellectual capital statements: Lessons from 23 Danish Firms'', paper for Workshop on Accounting for Intangibles and the Virtual Organisation, Brussels, February 12-13.

Chan, K. H. (2009) "Impact of intellectual capital on organisational performance: An empirical study of companies in the Hang Seng Index", *The Learning Organization: An International Journal*, Vol. 16 No. 1, pp 4-21.

Chen, A-P. Chen, M-Y. (2005)," A Review of Survey Research in Knowledge Management Performance Measurement: 1995-2004", *Journal of Universal Knowledge Management*, Vol. 0 No. 1, pp. 4-13

Chen, M. C. Cheng, S. J. and Hwang, Y. (2005), "An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance", *Journal of Intellectual Capital*, Vol. 6 No. 2, pp. 159-76.

Damodaran, A. (2002) "Investment Valuation: Tools and Techniques for Determining the Value of Any Asset", *John Wiley & Sons*, 2nd edition.

Dawson, R. (2000), "*Developing Knowledge-based Client Relationships: The Future of Professional Service*", Butterworth-Heinemann, Woburn, MA.

Drucker, P. J. (1993), "Post-capitalist society", *Harper Collins Publisher*, New York.

Edvinsson, L. and Sullivan P., (1996), "Developing a Model for Managing Intellectual Capital", *European Management Journal*, Vol. 14 No. 4, pp. 356-364.

Edvinsson, L. (1997), ”Developing intellectual capital at Skandia”, *Long Range Planning,* Vol. 30 No. 3, pp. 366-373.

Edvinsson, L. (2008), “Knowledge navigation and a cultivating ecosystem for intellectual capital”, Chaper 1, in Ahonen, Guy (Ed) Inspired by knowledge in organisations, Helsinki, 2008, Hanken #182.

Edvinsson, L. Malone, M. (1997), “Intellectual Capital: Realizing Your company's True Value by Finding its Hidden Brain Power”, New York, N.Y. *Harper Collins Publishers*, Inc.

Edvinsson, L. and Malone, M. (1998), “Intellectual Capital”, *Harper Collins Publishers Inc*, Great Britain.

Fama, E. French, K. (1993), “Common risk factors in the returns on stocks and bonds”, *Journal of Financial Economics* Vol. 33 No. 1, pp. 3–57.

Firer, S. and Williams, S. M. (2003), “Intellectual capital and traditional measures of corporate performance”, *Journal of Intellectual Capital,* Vol. 4 No. 3, pp. 348-360.

Guthrie, J., Petty, R., Johanson, U., (2001), “Sunrise in the knowledge economy – Managing, measuring and reporting intellectual capital”, *Accounting, Auditing & Accountability Journal*, Vol. 14 No. 4, pp 365-382.

Guthrie, J. Johanson, U. Bukh, P. N. and Sánchez, P. (2003). “Intangibles and the transparent enterprise: new strands of knowledge”, *Journal of Intellectual Capital*, Vol. 4 No. 4, pp. 429-440.

Gujarati, N. Damodar (2006), “Essentials of Econometrics”, McGraw-Hill Education

Habib, A. M. Ljungqvist, A. (2005), “Firm Value and Managerial Incentives: A Stochastic Frontier Approach“, *Journal of Business*, vol. 78, no. 6, pp 2053-2093.

Hall, B.H., Jaffe, A.,Trajtenberg, M. (2005),”Market value and patent citations”, *Rand Journal of Economics*, Vol. 36 No. 1 pp. 16-38.

Hamel,G., Prahalad, C.K. (1994),”Competing for the future”, *Harvard Business School Press*, Boston MA.

Intellectual Capital Sweden, Available at: http://intellectualcapital.se.gamma.levonline.com (Accessed: 18th of May, 2009).

Johanson, U. Eklöv, G. Holmgren, M. Mårtensson, M. (1999), “Human resource costing and accounting versus the Balanced Scorecard: a literature survey of experience with the concepts”, paper presented at the International Symposium Measuring Reporting Intellectual Capital: Experiences, Issues, and Prospects, OECD, Amsterdam, June.

Kald, M, Nilsson, F. (2000), “Performance measurement at Nordic companies”, *European Management Journal,* Vol. 18 No 1, pp. 113-127.

Karlgaard, R., (1993), “Rest in peace, book value”, *Forbes Magazine*, Vol. 152 No. 10, pp. 9-10.

Kaplan, R. Norton, D. (1992), “The Balanced Scorecard – Measures that Drive Performance“, *Harvard Business Review*, January-February, pp. 71-79.

Khan, S. (2008), “Intellectual Capital and the Perceived Relevance of the Balance Sheet as a Value Measure for Corporations”, *Journal of American Academy of Business*, Vol. 12 No. 2 pp 83-90.

Kujansivu, P. Lönnqvist, A. (2007), “Investigating the value and efficiency of intellectual capital”, *Journal of Intellectual Capital,* Vol. 8 No. 2, pp. 272-287.

Lang, H.P, L, Stulz, M.R (1994) “Tobin's q, Corporate Diversification, and Firm Performance”, *The Journal of Political Economy*, Vol. 102, No. 6, pp. 1248-1280.

Leliaert, P.J.C. Candries, W.Tilmans, R. (2003), “Identifying and managing IC: a new classification”, *Journal of Intellectual Capital*, Vol. 4 No. 2, pp. 202–214.

Lev, B. Mintz, S.L. (1999), "Seeing is believing: a better approach to estimating knowledge capital", *CFO Magazine*, February, pp. 29-37.

Lev, B. (2001a), “Intangibles: Management, and Reporting*”*, *Brookings Institution Press*, Washington DC.

Lev, B. Hand, R. J. (2001b),” Intangibles: Management, Measurement, and Reporting”, *The Accounting Review*, Vol. 77 No. 3, pp. 696-697.

Luthy, D.H. (1996), "Intellectual capital and its measurement", Utah State University, Logan, UT, available at: www3.bus.osaka-cu.ac.jp/apira98/archives/htmls/25.htm (accessed: 16th of April 2009).

Lynn, L. E. (1998a),” Performance evaluation in the new economy: bringing the measurement and evaluation of intellectual capital into the management planning and control system”, *International Journal of Technology Management*, Vol. 16 No. 1-3 pp. 162-176.

Lynn, L. E. (1998b), “Managing intellectual capital: the issues and practice”, *Management Accounting Issues Management Accounting Practice Handbook*, Paper 16, Hamilton, Society of Management Accountants, Ontario, Canada.

Marr, B. Gupta, O. Pike, S. Roos, G. (2003), “Intellectual capital and knowledge management effectiveness”, *Management Decision*, Vol. 42 No. 8, pp. 771-781.

Marr, B. Chatzkel, J. (2004), “Intellectual capital at the crossroads: managing, measuring and reporting of IC”, *Journal of Intellectual Capital*, Vol. 5 No. 2, pp. 224-229.

Martin, W. J. (2004), “Demonstrating knowledge value: A broader perspective on metrics”, *Journal of Intellectual Capital*, Vol. 5 No. 1, pp. 77-91.

McPherson, P.K. Pike, S. (2001),”Accounting, empirical measurement and Intellectual Capital”, *Journal of Intellectual Capital*, Vol. 2 No. 3 pp. 246-260.

Miller, W. (1999), “Building the ultimate resource”, *Management Review*, Vol. 88 No. 1 pp. 42-46.

Mouritsen, J. (2004), “Measuring and intervening: how do we theorise intellectual capital management”, *Journal of Intellectual Capital*, Vol. 5 No. 2, pp. 257-267.

MSCI Barra, available at: www.mscibarra.com (accessed: 5th of May, 2009).

Mølbjerg, K. (2006), ”Conceptualizing intellectual capital as language game and power”, *Journal of Intellectual Capital*, Vol. 7 No. 1, pp. 78-92.

Nazari, J. Irene, M. (2007), “Extended VAIC model: measuring intellectual capital components”, *Journal of Intellectual Capital,* Vol. 8 No. 4 pp. 595-609.

O’Donnell, D. (2004), “Theory and method on intellectual capital creation: addressing communicative action through relative methodics”, *Journal of Intellectual Capital*, Vol. 5 No. 2, pp. 294-311.

Organisation for Economic Co-operation and Development (OECD) (1999), “Guidelines and instructions for OECD Symposium”, International Symposium Measuring Reporting Intellectual Capital: Experiences, Issues, and Prospects, June, Amsterdam, OECD, Paris.

OMX, available at: www.nasdaqomxnordic.com (accessed: 5th of May, 2009).

Osterland, A. (2001), “Grey matters: CFO’s Third Annual Knowledge Capital Scorecard”, *CFO Magazine*, April, available at: http://www.cfo.com/article.cfm/2992913 (accessed: 16th of April 2009).

Pedrini, M. (2007),"Human capital convergences in intellectual capital and sustainability reports", *Journal of Intellectual Capital*, Vol. 8 No. 2, pp. 346-366.

Petty, R. Guthrie, J. (2000), "Intellectual capital literature review: measurement, reporting and management", *Journal of Intellectual Capital*, Vol. 1 No.2, pp 155-176.

Pulic, A. (1998), "Measuring the performance of intellectual potential in knowledge economy", available at: www. vaic-on.net (accessed: 3rd of April 2009).

Pulic, A. (2000), "MVA and VAIC Analysis of randomly selected companies from FTSE 250", available at: www. vaic-on.net (accessed: 3rd of April 2009).

Pulic, A. (2004), "Intellectual capital – does it create or destroy value?", *Measuring Business Excellence*, Vol. 8 No. 1, pp. 62-68.

Rastogi, P. N. (2000), "Knowledge management and intellectual capital – the new virtuous reality of competitiveness", *Human Systems Management,* Vol. 19 No. 1, pp. 39-48.

Rodov, I. Leliaert, P. (2002), "FiMIAM: Financial Methods of Intangible Assets Measurement", *Journal of Intellectual Capital,* Vol. 3 No. 3, pp. 323-337.

Roos, G. Roos, J. (1997), "Measuring your company's intellectual performance", *Long Range Planning,* Vol. 30 No. 3, pp. 413-426.

Roos, J. Roos, G. Dragonetti, N.C. Edvinsson, L. (1997), "*Intellectual Capital: Navigating in the New Business Landscape*", Macmillan, Houndmills.

Roos, G. (2000), "Distributors ready for online challenge", *Electronic Engineering Times*, No. 1131, pp. 148.

Roos, G. Pike, S. Fernström, L. (2006),"*Managing Intellectual Capital in Practice*", Elsevier Science & Technology Books.

Shiu, H. (2006), "The Application of the Value Added Intellectual Coefficient to Measure Corporate Performance: Evidence from Technological Firms", *International Journal of Management*, Vol. 23 No. 2 pp 356-365.

Singhal, A. (2004), "Accounting For The New Economy", *Chartered Accountant*, April 2004 pp 1038-1041.

Skandia (1994),"Visualizing Intellectual Capital in Skandia – Supplement to Skandia's 1994 Annual Report", available at: www.skandia.com/financials (accessed 8 April 2009).

Skandia (1997), ”Intelligent enterprising – Supplement to Skandia’s 1997 Annual Report”, available at: www.skandia.com/financials (accessed: 15th of April 2009).

Smith, A. (1776), An Inquiry into the Nature and Causes of the Wealth of Nations*,* Edited by S. M. Soares, MetaLibri (2007), available at: http://metalibri.wikidot.com/title:an-inquiry-into-the-nature-and-causes-of-the-wealth-of-nations:smith-a (accessed: 31st of Mars, 2009)

Stern Stewart & Co, available at: http://.sternstewart.com/ (accessed: 4th of April, 2009).

Stewart, T.A. (1994), “Your company’s most valuable asset: Intellectual capital” *Fortune Magazine*, Vol. 130 No. 7, pp. 68-74.

Stewart, T. (1995), “Trying to grasp the intangible”, *Fortune Magazine*, Vol. 132 No. 7, pp. 157-160.

Stewart, T.A. (1997), “Intellectual Capital: The New Wealth of Organizations”, *Bantam Doubleday Dell Publishing Group*, Broadway, New York.

Stewart, T. (2001), “Accounting Gets Radical: The green-eyeshade gang isn’t measuring what really matters to investors. Some far-out thinkers plan to change that.”, *Fortune Magazine*, April, available at: http://www.fortune.com/fortune_archive/2001/04/16/301042 (accessed September 2002).

Sullivan, H.P. Sullivan H.P. (2000),” Valuing intangibles companies: An intellectual capital approach”, *Journal of Intellectual Capital*, Vol. 1 No. 4, pp. 328-340.

Sveiby, K-E. (1997) “New Organizational Wealth: Managing and Measuring Knowledge-Based Assets”, *Berrett-Koehler Publishers,* San Francisco, CA.

Sveiby, K.E (1998), “Intellectual capital: thinking ahead", *Australian CPA*, Vol. 68 No.5, pp. 18-22.

Sveiby, K-E. (2001a), “The invisible balance sheet”, available at: http://www.sveiby.com/articles/InvisibleBalance.html (accessed: 16th of April 2009).

Sveiby, K-E. (2001b),”A knowledge-based theory of the firm to guide in strategy formulation”, Journal of Intellectual Capital, Vol. 2 No 4, pp. 344-358.

Sveiby, K-E. (2007), “Method of measuring intangible assets”, p. 1-6, available at: www.sveiby.com/articles/IntangibleMethods.htm (accessed: 1st of April 2009).

Williams, M. (2001), “Is a company’s intellectual capital performance and intellectual capital disclosure practices related: evidence from publicly listed companies from the FTSE 100”, *Journal of Intellectual Capital*, Vol. 2 No. 3, pp. 192-203.

Wooldridge, M. J. (2003). “Introductory Econometrics”, Thomson South-Western

Appendix 1 - Total sample

Year	Company	Industry	VAIC	FSIZE	DEBT	MB	ROA	ATO
2007	AarhusKarlshamn	Consumer Staples	3.219	6.680	0.508	1.985	0.077	1.488
2007	Alfa Laval	Industrials	3.750	7.595	0.155	5.014	0.195	1.117
2007	Assa Abloy	Industrials	3.053	7.653	0.361	2.909	0.146	0.910
2007	AstraZeneca	Health Care	4.011	7.499	0.323	4.233	0.176	0.623
2007	Atlas Copco	Industrials	4.397	7.907	0.406	5.553	0.215	1.135
2007	Axfood	Consumer Staples	3.822	7.136	0.094	6.351	0.137	4.437
2007	Axis	Information Technology	3.916	7.043	0.006	20.001	0.395	1.828
2007	BE Group	Materials	4.030	6.459	0.300	3.393	0.180	2.688
2007	Betsson	Consumer Discretionary	5.411	6.450	0.000	4.528	0.224	0.766
2007	Billerud	Materials	3.081	6.535	0.343	1.182	0.063	0.843
2007	Björn Borg	Consumer Discretionary	5.525	6.459	0.000	8.398	0.279	0.972
2007	Boliden	Materials	4.760	7.347	0.217	1.718	0.195	1.219
2007	Broström	Industrials	3.779	6.472	0.567	1.201	0.060	0.412
2007	Bure Equity	Financials	1.949	6.548	0.078	1.287	0.043	0.725
2007	Cardo	Industrials	2.893	6.780	0.209	2.036	0.127	1.506
2007	Carnegie	Financials	2.787	6.988	0.291	3.272	0.019	0.126
2007	Castellum	Financials	8.531	7.043	0.451	0.984	0.033	0.081
2007	Clas Ohlson	Consumer Discretionary	3.211	6.955	0.000	6.587	0.275	2.122
2007	Electrolux	Consumer Discretionary	3.252	7.470	0.156	1.841	0.072	1.620
2007	Elekta	Health Care	2.814	7.027	0.185	5.734	0.089	0.847
2007	Eniro	Consumer Discretionary	3.549	6.971	0.578	2.309	0.095	0.351
2007	Ericsson	Information Technology	2.627	8.383	0.117	1.800	0.092	0.804
2007	Fabege	Financials	7.447	7.054	0.542	0.991	0.020	0.066
2007	Gant	Consumer Discretionary	15.765	6.730	0.273	13.514	0.206	1.025
2007	Getinge	Health Care	3.254	7.514	0.412	4.953	0.112	0.736
2007	H&M	Consumer Discretionary	4.291	8.464	0.000	9.080	0.450	1.918
2007	Hakon Invest	Financials	0.490	7.018	0.008	1.065	-0.009	0.105
2007	Haldex	Industrials	2.878	6.396	0.291	1.340	0.059	1.598
2007	Handelsbanken	Financials	3.958	8.103	0.565	1.700	0.008	0.050
2007	Hemtex	Consumer Discretionary	3.425	6.589	0.092	7.899	0.260	1.853
2007	Hexagon	Industrials	2.783	7.536	0.407	3.435	0.087	0.597
2007	Holmen	Materials	2.929	7.174	0.184	0.881	0.047	0.582
2007	Hufvudstaden	Financials	12.239	7.089	0.162	1.040	0.034	0.062
2007	Husqvarna	Industrials	3.866	7.340	0.467	2.974	0.127	1.193
2007	Höganäs	Materials	3.137	6.665	0.216	1.673	0.109	1.133
2007	Industrivärden	Financials	-30.928	7.483	0.170	0.555	-0.032	0.034
2007	Intrum Justitia	Industrials	3.222	6.959	0.330	4.937	0.126	0.608
2007	Investor	Financials	3.382	7.812	0.108	0.418	0.004	0.016
2007	JM	Financials	4.019	7.071	0.026	3.025	0.214	1.285
2007	KappAhl	Consumer Discretionary	4.276	6.687	0.490	5.462	0.215	1.583
2007	Karo Bio	Health Care	-0.163	5.718	0.002	1.325	-0.477	0.017
2007	Kaupting Bank	Financials	3.655	8.813	0.605	1.879	0.013	0.070
2007	Kinnevik	Financials	2.928	7.497	0.143	0.625	0.011	0.122
2007	Kungsleden AB	Financials	11.116	6.992	0.643	1.087	0.039	0.098
2007	Lindab	Industrials	3.382	7.064	0.340	3.904	0.178	1.261
2007	Lindex	Consumer Discretionary	0.752	6.854	0.132	13.063	-0.433	1.811
2007	Lundbergföretagen	Financials	3.389	7.144	0.172	0.528	0.042	0.302
2007	Lundin Petroleum	Energy	12.443	7.328	0.138	2.193	0.095	0.265
2007	Meda	Health Care	3.616	7.316	0.487	2.213	0.059	0.289
2007	MTG	Consumer Discretionary	3.374	6.818	0.047	1.157	0.139	1.038
2007	Munters	Industrials	3.824	6.754	0.316	4.748	0.150	1.648
2007	NCC	Industrials	3.538	6.927	0.097	1.173	0.082	1.728
2007	Net Insight	Information Technology	2.891	6.204	0.000	8.830	0.079	0.877
2007	New Wave Group	Consumer Discretionary	2.790	6.483	0.529	2.132	0.079	0.897
2007	NIBE Industrier	Industrials	3.031	6.799	0.441	4.070	0.099	1.202
2007	Nobia	Consumer Discretionary	3.058	6.994	0.188	2.376	0.126	1.659
2007	Nokia	Information Technology	3.760	8.009	0.030	6.904	0.192	1.416
2007	Nordea	Financials	3.636	8.447	0.274	1.737	0.010	0.043
2007	OMX	Financials	3.193	7.499	0.159	6.196	0.101	0.317
2007	Orc Software	Information Technology	2.533	6.393	0.000	7.380	0.103	0.776
2007	Oriflame	Consumer Staples	6.178	6.387	0.489	26.278	0.310	2.214
2007	PA Resources	Energy	19.893	6.869	0.362	2.225	0.263	0.410
2007	Peab	Industrials	3.478	6.998	0.069	2.767	0.088	2.101
2007	Q-Med	Health Care	2.245	6.922	0.043	6.075	0.090	0.764
2007	Ratos	Financials	2.083	7.311	0.362	1.717	0.032	0.594
2007	Rezidor Hotel	Financials	3.220	6.763	0.081	3.051	0.140	1.972

2007	RNB	Consumer Discretionary	2.580	6.617	0.249	2.663	0.087	1.163
2007	SAAB	Industrials	2.705	7.120	0.116	1.199	0.061	0.692
2007	Sandvik	Industrials	3.548	8.120	0.343	4.612	0.167	1.026
2007	SAS	Industrials	2.440	7.135	0.182	0.797	0.026	1.087
2007	SCA	Materials	2.454	7.829	0.289	1.061	0.040	0.735
2007	SCANIA	Industrials	3.968	7.790	0.389	2.483	0.131	0.974
2007	SEB	Financials	3.131	8.038	0.416	1.426	0.007	0.052
2007	Securitas	Industrials	7.214	7.496	0.425	3.553	0.072	1.675
2007	Securitas Direct	Industrials	3.197	6.955	0.042	5.331	0.102	1.418
2007	Skanska	Industrials	2.683	7.684	0.046	2.356	0.034	1.780
2007	SKF	Industrials	3.335	7.648	0.172	2.530	0.168	1.291
2007	SSAB	Materials	3.875	7.627	0.500	1.465	0.099	0.531
2007	Stora Enso	Materials	2.847	6.796	0.291	0.837	0.058	0.877
2007	Swedbank	Financials	3.607	7.975	0.545	1.387	0.009	0.057
2007	Tele2	Telecom. services	4.440	7.721	0.217	1.963	0.057	0.957
2007	Telelogic	Information Technology	2.548	6.666	0.154	2.868	0.128	0.683
2007	TeliaSonera	Telecom. services	4.331	8.434	0.212	2.317	0.095	0.471
2007	TietoEnator	Information Technology	4.116	6.042	0.205	2.324	0.145	1.457
2007	TradeDoubler	Information Technology	3.615	6.597	0.441	10.937	0.089	1.218
2007	Trelleborg	Industrials	2.737	7.040	0.376	1.103	0.068	1.081
2007	Unibet Group	Consumer Discretionary	4.142	5.693	0.385	5.156	0.106	0.386
2007	Wallenstam	Financials	3.320	6.813	0.479	0.787	0.009	0.064
2007	West Siberian	Energy	6.433	6.705	0.036	1.212	0.027	0.346
2007	Wihlborgs	Financials	8.849	6.637	0.568	0.995	0.032	0.076
2007	Volvo	Industrials	3.120	8.342	0.346	2.674	0.067	0.912
2006	AarhusKarlshamn	Consumer Staples	2.634	6.914	0.464	3.590	0.043	1.608
2006	Alfa Laval	Industrials	3.146	7.538	0.125	5.141	0.131	1.098
2006	Assa Abloy	Industrials	3.073	7.713	0.393	3.803	0.137	0.903
2006	AstraZeneca	Health Care	4.048	7.624	0.043	5.374	0.285	0.971
2006	Atlas Copco	Industrials	3.173	7.985	0.131	2.960	0.171	0.925
2006	Axfood	Consumer Staples	3.569	7.172	0.019	6.136	0.150	4.769
2006	BE Group	Materials	4.509	6.547	0.295	5.307	0.184	2.324
2006	Billerud	Materials	3.065	6.795	0.341	2.331	0.066	0.900
2006	Biovitrum	Health Care	2.249	6.716	0.000	3.764	0.065	0.581
2006	Boliden	Materials	6.253	7.707	0.094	3.166	0.310	1.308
2006	Broström	Industrials	4.064	6.664	0.541	1.793	0.078	0.426
2006	Cardo	Industrials	2.711	6.892	0.181	2.612	0.102	1.464
2006	Carnegie	Financials	3.788	7.011	0.392	4.730	0.034	0.129
2006	Castellum	Financials	8.750	7.175	0.443	1.469	0.036	0.083
2006	Clas Ohlson	Consumer Discretionary	3.226	6.950	0.000	7.094	0.274	2.004
2006	Electrolux	Consumer Discretionary	3.549	7.567	0.096	2.798	0.069	1.627
2006	Elekta	Health Care	2.903	7.043	0.208	5.904	0.093	0.843
2006	Eniro	Consumer Discretionary	3.388	7.215	0.515	3.201	0.099	0.371
2006	Ericsson	Information Technology	2.893	8.643	0.072	3.656	0.136	0.883
2006	Fabege	Financials	7.188	7.242	0.499	1.436	0.025	0.081
2006	Gant	Consumer Discretionary	5.239	6.545	0.340	12.483	0.196	1.075
2006	Getinge	Health Care	2.959	7.461	0.301	4.833	0.124	0.849
2006	H&M	Consumer Discretionary	4.153	8.367	0.000	8.387	0.432	1.929
2006	Haldex	Industrials	2.921	6.557	0.259	1.905	0.078	1.724
2006	Handelsbanken	Financials	4.361	8.110	0.518	1.946	0.010	0.044
2006	Hexagon	Industrials	2.733	7.393	0.336	2.885	0.098	0.744
2006	HiQ	Information Technology	3.271	6.326	0.026	5.558	0.278	1.440
2006	Holmen	Materials	3.130	7.268	0.183	1.113	0.056	0.585
2006	Hufvudstaden	Financials	9.232	7.186	0.164	1.302	0.028	0.056
2006	Husqvarna	Industrials	3.763	7.487	0.323	4.908	0.198	1.870
2006	Höganäs	Materials	3.058	6.787	0.220	2.334	0.092	1.010
2006	Intrum Justitia	Industrials	3.164	6.840	0.372	4.739	0.133	0.665
2006	JM	Financials	3.749	7.185	0.022	4.267	0.204	1.435
2006	KappAhl	Consumer Discretionary	6.147	6.540	0.571	8.411	0.189	1.501
2006	Kaupting Bank	Financials	5.051	8.789	0.676	1.903	0.023	0.063
2006	Kinnevik	Financials	2.524	7.391	0.202	0.714	0.012	0.132
2006	Kungsleden	Financials	13.704	7.156	0.537	1.478	0.063	0.135
2006	Lindab	Industrials	3.366	7.011	0.398	4.681	0.137	1.124
2006	Lindex	Consumer Discretionary	4.686	6.810	0.095	9.689	0.335	3.297
2006	LinkMed	Information Technology	1.142	5.779	0.000	2.032	0.001	-0.047
2006	LogicaCMG	Information Technology	2.396	6.456	0.215	1.876	0.053	0.779
2006	Lundbergföretagen	Financials	3.435	7.227	0.168	0.669	0.043	0.302
2006	Lundin Petroleum	Energy	13.875	7.397	0.084	2.788	0.103	0.246
2006	Meda	Health Care	3.650	7.462	0.377	6.736	0.100	0.473
2006	Micronic Laser Syst	Information Technology	3.170	6.479	0.173	2.717	0.083	0.706

2006	MTG	Consumer Discretionary	3.366	6.818	0.029	1.321	0.153	1.107
2006	Munters	Industrials	3.224	6.892	0.102	5.198	0.169	1.853
2006	NCC	Industrials	3.447	7.053	0.085	1.664	0.077	1.842
2006	NIBE Industrier	Industrials	3.314	6.968	0.369	7.236	0.128	1.278
2006	Nobia	Consumer Discretionary	3.140	7.183	0.194	4.092	0.128	1.650
2006	Nokia	Information Technology	3.757	7.788	0.014	5.129	0.236	1.886
2006	Nordea	Financials	3.731	8.437	0.296	1.984	0.011	0.040
2006	Observer	Industrials	2.611	6.460	0.325	2.307	0.075	0.702
2006	Old Mutual	Financials	3.578	6.982	0.028	1.326	0.014	0.129
2006	OMX	Financials	3.199	7.182	0.142	3.307	0.088	0.277
2006	PA Resources	Energy	7.229	7.020	0.394	4.531	0.091	0.190
2006	Peab	Industrials	3.810	7.056	0.161	3.475	0.081	1.864
2006	Q-Med	Health Care	2.902	7.026	0.046	8.498	0.191	0.823
2006	Ratos	Financials	2.050	7.275	0.307	1.733	0.037	0.619
2006	Rezidor Hotel	Financials	3.165	6.947	0.171	5.562	0.092	1.927
2006	SAAB	Industrials	2.573	7.334	0.065	2.200	0.047	0.650
2006	Sandvik	Industrials	3.443	8.072	0.238	4.514	0.183	1.120
2006	SAS	Industrials	2.702	7.282	0.319	1.171	0.036	1.221
2006	SCA	Materials	2.555	7.846	0.285	1.203	0.047	0.764
2006	SCANIA	Industrials	3.574	7.682	0.392	1.841	0.101	0.849
2006	SEB	Financials	3.125	8.153	0.432	2.119	0.008	0.052
2006	Securitas	Industrials	7.201	7.568	0.384	3.850	0.045	1.799
2006	Securitas Direct	Industrials	3.076	6.878	0.079	5.155	0.087	1.439
2006	Skanska	Industrials	2.622	7.728	0.049	2.786	0.034	1.812
2006	SKF	Industrials	3.010	7.710	0.178	2.706	0.134	1.172
2006	SSAB	Materials	3.801	7.496	0.051	2.041	0.239	1.367
2006	Stora Enso	Materials	2.653	6.865	0.302	0.939	0.033	0.839
2006	Swedbank AB	Financials	3.731	8.107	0.537	2.135	0.010	0.036
2006	Swedish Match	Consumer Staples	5.742	7.546	0.534	15.356	0.201	0.838
2006	Tele2	Telecom. services	3.880	7.609	0.323	1.410	0.029	0.822
2006	Teleca	Information Technology	2.275	6.236	0.084	0.884	-0.013	0.933
2006	Telelogic	Information Technology	2.422	6.578	0.193	2.650	0.095	0.673
2006	TeliaSonera	Telecom. services	4.501	8.402	0.148	2.119	0.107	0.486
2006	TietoEnator	Information Technology	3.195	6.255	0.189	2.890	0.106	1.267
2006	TradeDoubler	Information Technology	3.689	6.757	0.000	16.382	0.208	1.911
2006	Trelleborg	Industrials	2.579	7.123	0.377	1.384	0.054	1.012
2006	Unibet Group	Consumer Discretionary	5.492	5.616	0.135	4.446	0.223	0.575
2006	Wihlborgs	Financials	9.893	6.739	0.575	1.547	0.039	0.083
2006	Volvo	Industrials	3.137	8.281	0.266	2.196	0.091	1.028
2005	Alfa Laval	Industrials	2.733	7.283	0.181	3.382	0.075	1.047
2005	Anoto Group	Information Technology	-4.752	6.529	0.000	6.080	-0.150	0.160
2005	Assa Abloy	Industrials	2.854	7.637	0.360	3.022	0.124	0.860
2005	AstraZeneca	Health Care	3.817	7.651	0.051	5.652	0.256	0.957
2005	Atlas Copco	Industrials	3.500	7.871	0.176	2.889	0.170	0.975
2005	Axfood	Consumer Staples	3.181	7.083	0.009	4.285	0.114	3.729
2005	Axis	Information Technology	2.899	6.604	0.013	9.858	0.242	1.653
2005	Bilia	Consumer Discretionary	3.241	6.539	0.168	2.689	0.052	2.049
2005	Billerud	Materials	1.985	6.728	0.326	2.114	-0.027	0.880
2005	Boliden	Materials	3.984	7.274	0.292	1.828	0.131	0.908
2005	Boss Media	Information Technology	2.655	6.099	0.000	5.129	0.054	0.598
2005	Broström	Industrials	3.846	6.688	0.517	1.824	0.081	0.482
2005	Bure Equity	Financials	2.901	6.157	0.121	0.774	0.068	1.367
2005	Capio	Health Care	3.056	7.077	0.469	2.580	0.059	0.733
2005	Cardo	Industrials	2.565	6.766	0.102	1.988	0.082	1.470
2005	Carnegie	Financials	3.511	6.899	0.303	4.606	0.031	0.132
2005	Castellum	Financials	8.530	7.069	0.440	1.312	0.039	0.090
2005	Clas Ohlson	Consumer Discretionary	3.253	6.920	0.000	7.857	0.264	1.855
2005	Electrolux	Consumer Discretionary	3.026	7.768	0.105	2.262	0.085	1.626
2005	Elekta	Health Care	2.504	6.877	0.186	4.503	0.062	0.704
2005	Enea Data	Information Technology	2.601	6.332	0.000	6.336	0.105	1.461
2005	Eniro	Consumer Discretionary	2.714	7.258	0.568	3.908	0.054	0.249
2005	Ericsson	Information Technology	3.138	8.637	0.130	4.137	0.146	0.793
2005	Fabege	Financials	17.489	7.163	0.475	1.358	0.071	0.142
2005	Framfab	Information Technology	2.256	6.060	0.257	2.387	0.030	0.862
2005	FöreningsSparbanken	Financials	3.605	8.048	0.551	2.080	0.010	0.040
2005	Gambro	Health Care	2.124	6.911	0.157	0.441	0.037	0.500
2005	Getinge	Health Care	3.015	7.314	0.295	3.886	0.128	0.852
2005	Gunnebo	Industrials	3.591	6.537	0.345	2.849	0.061	1.390
2005	H&M	Consumer Discretionary	4.015	8.267	0.000	7.128	0.398	1.849
2005	Haldex	Industrials	2.871	6.542	0.260	1.853	0.076	1.637

2005	Handelsbanken	Financials	4.467	8.102	0.520	1.927	0.010	0.038
2005	Hexagon	Industrials	2.520	7.199	0.491	2.954	0.050	0.530
2005	HiQ	Information Technology	3.210	6.327	0.020	5.837	0.262	1.275
2005	Holmen	Materials	2.841	7.212	0.181	1.014	0.044	0.512
2005	Hufvudstaden	Financials	10.673	7.013	0.214	1.195	0.040	0.082
2005	Höganäs	Materials	2.645	6.765	0.284	2.283	0.049	0.883
2005	IBS	Information Technology	2.456	6.273	0.198	1.599	0.031	1.027
2005	IFS	Information Technology	3.932	6.300	0.263	3.247	0.035	1.078
2005	Indutrade	Industrials	3.429	6.551	0.207	4.986	0.168	2.001
2005	Intrum Justitia	Industrials	3.243	6.757	0.330	4.446	0.130	0.687
2005	JM	Financials	2.932	6.939	0.079	2.623	0.121	1.212
2005	Kinnevik	Financials	1.807	7.201	0.217	0.681	0.007	0.139
2005	Kungsleden	Financials	13.505	7.020	0.665	1.574	0.035	0.080
2005	Lindex	Consumer Discretionary	3.463	6.738	0.005	5.396	0.187	2.885
2005	Lundbergföretagen	Financials	3.172	7.105	0.193	0.605	0.041	0.296
2005	Lundin Petroleum	Energy	14.769	7.334	0.099	5.870	0.245	0.535
2005	Meda	Health Care	2.822	7.052	0.442	3.001	0.031	0.254
2005	Micronic Laser Syst	Information Technology	3.267	6.644	0.193	4.298	0.085	0.683
2005	MTG	Consumer Discretionary	2.911	6.694	0.127	0.924	0.102	0.822
2005	Munters	Industrials	3.026	6.731	0.122	3.677	0.144	1.785
2005	NCC	Industrials	3.195	6.892	0.114	1.150	0.064	1.849
2005	New Wave Group	Consumer Discretionary	2.715	6.573	0.492	3.299	0.082	0.927
2005	NIBE Industrier	Industrials	2.936	6.687	0.362	4.738	0.082	1.234
2005	Nobia	Consumer Discretionary	2.940	6.968	0.185	2.923	0.111	1.613
2005	Nokia	Information Technology	3.625	7.809	0.018	5.303	0.205	1.582
2005	Nordea	Financials	3.489	8.330	0.311	1.761	0.009	0.050
2005	Observer	Industrials	2.042	6.393	0.280	1.150	0.048	0.476
2005	OMX	Financials	3.041	7.117	0.184	2.765	0.089	0.299
2005	Oriflame	Consumer Staples	4.247	6.161	0.325	9.059	0.279	2.003
2005	Peab	Industrials	3.296	6.885	0.212	2.294	0.068	1.956
2005	Q-Med	Health Care	2.128	6.793	0.052	5.590	0.076	0.688
2005	Ratos	Financials	1.912	7.056	0.260	1.039	0.030	0.408
2005	SAAB	Industrials	2.530	7.247	0.085	1.924	0.042	0.638
2005	Sandvik	Industrials	3.286	7.943	0.252	3.737	0.158	1.088
2005	SAS	Industrials	3.284	7.235	0.447	1.494	0.017	1.096
2005	SCA	Materials	2.509	7.765	0.284	1.032	0.040	0.718
2005	SCANIA	Industrials	3.379	7.459	0.369	1.212	0.088	0.861
2005	SEB	Financials	2.792	8.023	0.431	1.859	0.006	0.048
2005	SECTRA	Health Care	2.423	6.400	0.081	5.826	0.104	0.651
2005	Securitas	Industrials	4.895	7.662	0.382	3.094	0.097	1.477
2005	Skandia	Financials	2.442	7.686	0.007	4.034	0.004	0.031
2005	Skanska	Industrials	2.598	7.680	0.048	2.597	0.035	1.806
2005	SKF	Industrials	2.928	7.654	0.109	2.559	0.126	1.248
2005	SSAB	Materials	3.851	7.288	0.081	1.370	0.243	1.279
2005	Stora Enso	Materials	2.498	6.844	0.338	0.913	0.017	0.732
2005	Swedish Match	Consumer Staples	3.989	7.456	0.265	5.630	0.165	0.814
2005	Tele2	Telecom. services	5.074	7.530	0.249	0.968	0.057	0.791
2005	Teleca	Information Technology	2.355	6.343	0.094	1.114	0.034	1.002
2005	Telelogic	Information Technology	2.353	6.696	0.022	3.652	0.110	0.725
2005	TeliaSonera	Telecom. services	4.662	8.270	0.136	1.530	0.101	0.453
2005	TietoEnator	Information Technology	3.737	6.369	0.256	4.787	0.130	1.386
2005	TradeDoubler	Information Technology	2.688	6.614	0.000	21.829	0.084	2.063
2005	Trelleborg	Industrials	2.488	7.108	0.331	1.276	0.059	1.000
2005	Unibet Group	Consumer Discretionary	5.891	5.520	0.198	5.464	0.177	0.387
2005	Wallenstam	Financials	5.512	6.738	0.527	0.928	0.022	0.081
2005	Wihlborgs	Financials	9.277	6.567	0.538	1.298	0.040	0.093
2005	WM-Data	Information Technology	3.504	6.996	0.272	3.516	0.069	1.193
2005	Volvo	Industrials	2.967	8.180	0.297	1.929	0.070	0.955
2004	Active Biotech	Health Care	1.617	6.090	0.321	7.588	-0.642	0.223
2004	Alfa Laval	Industrials	2.821	7.079	0.190	2.417	0.068	1.114
2004	Assa Abloy	Industrials	3.107	7.595	0.407	3.767	0.091	0.895
2004	AstraZeneca	Health Care	3.393	7.491	0.046	4.128	0.184	0.878
2004	Atlas Copco	Industrials	3.340	7.623	0.156	1.885	0.150	1.063
2004	Axfood	Consumer Staples	3.506	7.081	0.039	4.797	0.116	4.827
2004	Bilia	Consumer Discretionary	3.257	6.409	0.187	2.231	0.083	3.340
2004	Billerud	Materials	3.168	6.784	0.241	2.000	0.109	1.003
2004	Boliden	Materials	3.422	6.915	0.365	0.917	0.075	0.917
2004	Boss Media	Information Technology	3.155	6.115	0.000	5.799	0.144	0.591
2004	Broström	Industrials	3.220	6.461	0.521	1.460	0.056	0.509
2004	Capio	Health Care	3.197	6.799	0.402	1.907	0.074	1.007

2004	Cardo	Industrials	2.572	6.757	0.064	2.043	0.065	1.578
2004	Carnegie	Financials	3.262	6.759	0.323	4.331	0.024	0.143
2004	Castellum	Financials	9.827	6.989	0.595	1.981	0.054	0.138
2004	Clas Ohlson	Consumer Discretionary	3.259	6.779	0.000	6.805	0.273	1.917
2004	Electrolux	Consumer Discretionary	3.119	7.632	0.137	1.829	0.092	1.676
2004	Elekta	Health Care	2.503	6.610	0.075	2.886	0.076	0.943
2004	Enea Data	Information Technology	3.052	6.228	0.000	6.961	0.035	1.411
2004	Eniro	Consumer Discretionary	3.883	7.027	0.432	6.059	0.121	0.711
2004	Ericsson	Information Technology	3.426	8.526	0.146	4.342	0.149	0.819
2004	Fabege	Financials	10.398	7.117	0.618	1.177	0.020	0.068
2004	Framfab	Information Technology	2.598	5.748	0.282	2.507	-0.079	1.048
2004	FöreningsSparbanken	Financials	3.397	7.916	0.551	1.889	0.010	0.052
2004	Gambro	Health Care	2.639	6.943	0.198	0.485	0.069	0.870
2004	Getinge	Health Care	3.301	7.193	0.317	3.898	0.128	0.935
2004	Gunnebo	Industrials	3.201	6.562	0.276	2.056	0.067	1.325
2004	H&M	Consumer Discretionary	3.875	8.198	0.000	7.103	0.380	1.911
2004	Haldex	Industrials	3.229	6.410	0.279	1.868	0.069	1.769
2004	Handelsbanken	Financials	4.162	8.051	0.538	1.840	0.010	0.044
2004	Hexagon	Industrials	2.992	6.742	0.391	2.355	0.074	1.147
2004	Holmen	Materials	2.960	7.155	0.189	1.040	0.054	0.596
2004	Hufvudstaden	Financials	10.110	6.974	0.299	1.809	0.054	0.131
2004	Höganäs	Materials	3.180	6.773	0.286	2.687	0.097	0.885
2004	IBS	Information Technology	3.677	5.997	0.208	1.749	0.027	1.672
2004	IFS	Information Technology	4.704	5.985	0.237	2.092	-0.036	1.252
2004	Intentia	Information Technology	3.345	6.365	0.123	2.473	-0.037	1.238
2004	Intrum Justitia	Industrials	2.916	6.641	0.227	3.047	0.091	0.823
2004	Investor	Financials	15.242	7.585	0.318	0.710	0.089	0.120
2004	JM	Financials	2.272	6.730	0.179	1.528	0.062	1.021
2004	Kinnevik	Financials	2.354	7.180	0.325	1.046	0.021	0.259
2004	Kungsleden	Financials	11.457	6.677	0.718	1.356	0.046	0.128
2004	Lindex	Consumer Discretionary	2.817	6.411	0.003	2.840	-0.032	3.090
2004	Lundbergföretagen	Financials	3.479	7.034	0.163	0.858	0.055	0.387
2004	Lundin Petroleum	Energy	8.233	6.985	0.244	4.012	0.141	0.433
2004	Micronic Laser Syst	Information Technology	2.796	6.417	0.248	2.879	0.083	0.549
2004	MTG	Consumer Discretionary	2.877	6.446	0.178	1.028	0.082	1.120
2004	Munters	Industrials	3.303	6.688	0.156	4.385	0.130	1.927
2004	NCC	Industrials	3.061	6.589	0.157	0.577	0.042	1.739
2004	NIBE Industrier	Industrials	3.380	6.566	0.321	4.254	0.132	1.281
2004	Nobel Biocare	Health Care	3.742	6.724	0.002	9.647	0.256	0.843
2004	Nobia	Consumer Discretionary	3.219	6.802	0.263	2.580	0.109	1.626
2004	Nokia	Information Technology	3.629	7.717	0.011	3.662	0.187	1.328
2004	Nolato	Information Technology	3.348	6.135	0.201	2.085	0.122	1.503
2004	Nordea	Financials	3.127	8.263	0.285	1.620	0.008	0.055
2004	Observer	Industrials	2.228	6.389	0.285	1.489	0.011	0.551
2004	OMX	Financials	2.452	6.992	0.187	2.630	0.053	0.473
2004	Oriflame	Consumer Staples	4.938	6.006	0.311	9.145	0.403	2.470
2004	Pricer	Information Technology	10.104	5.861	0.000	7.905	-0.339	1.483
2004	Proffice	Industrials	14.461	6.027	0.252	5.690	-0.096	2.750
2004	Q-Med	Health Care	1.562	6.657	0.049	3.717	0.007	0.551
2004	Ratos	Financials	1.483	6.918	0.142	0.917	0.004	0.342
2004	Rottneros	Materials	0.987	6.134	0.102	0.864	-0.079	0.994
2004	SAAB	Industrials	2.943	7.074	0.126	1.489	0.069	0.684
2004	Sandvik	Industrials	3.110	7.821	0.224	3.029	0.136	1.095
2004	SAS	Industrials	3.110	6.994	0.485	0.884	-0.017	1.033
2004	SCA	Materials	2.658	7.738	0.299	1.093	0.043	0.773
2004	SCANIA	Industrials	3.536	7.420	0.367	1.249	0.091	0.862
2004	SEB	Financials	2.779	7.917	0.412	1.619	0.006	0.037
2004	Securitas	Industrials	5.482	7.598	0.355	3.673	0.083	1.716
2004	Skandia	Financials	2.312	7.530	0.008	2.158	0.005	0.188
2004	Skanska	Industrials	2.886	7.493	0.066	1.936	0.043	1.988
2004	SKF	Industrials	2.901	7.458	0.033	1.729	0.127	1.313
2004	SSAB	Materials	3.350	7.076	0.100	0.917	0.172	1.143
2004	Stora Enso	Materials	2.525	6.859	0.246	0.898	0.019	0.756
2004	Swedish Match	Consumer Staples	3.519	7.394	0.248	5.681	0.123	0.914
2004	SwitchCore	Information Technology	-0.569	5.400	0.072	3.637	-0.306	0.987
2004	Tele2	Telecom. services	6.347	7.537	0.110	1.098	0.059	0.955
2004	Teleca	Information Technology	2.323	6.353	0.113	1.261	0.003	0.984
2004	Telelogic	Information Technology	2.805	6.533	0.009	4.945	0.154	0.997
2004	TeliaSonera	Telecom. services	4.662	8.270	0.136	1.530	0.101	0.453
2004	TietoEnator	Information Technology	3.256	6.265	0.130	3.287	0.099	1.623

2004	Tornet	Financials	11.741	6.530	0.753	1.044	0.070	0.188
2004	Trelleborg	Consumer Discretionary	2.652	6.957	0.354	1.117	0.049	1.088
2004	WM-Data	Information Technology	3.291	6.750	0.177	2.234	0.059	1.494
2004	Volvo	Industrials	2.859	8.034	0.284	1.557	0.058	0.966
2003	Active Biotech	Health Care	-0.633	6.313	0.019	7.107	-0.917	0.001
2003	Alfa Laval	Industrials	2.838	7.087	0.254	2.497	0.061	0.979
2003	Assa Abloy	Industrials	2.976	7.472	0.434	2.776	0.075	0.821
2003	AstraZeneca	Health Care	3.433	7.657	0.019	6.147	0.181	0.874
2003	Atlas Copco	Industrials	3.119	7.557	0.225	1.714	0.114	1.004
2003	Axfood	Consumer Staples	3.710	6.950	0.086	4.188	0.111	4.834
2003	Biacore	Health Care	2.522	6.218	0.004	2.623	0.128	0.644
2003	Bilia	Consumer Discretionary	3.102	6.373	0.155	1.781	0.071	3.262
2003	Billerud	Materials	3.611	6.769	0.221	1.833	0.168	1.052
2003	Boliden	Materials	2.318	6.810	0.522	1.059	0.014	0.491
2003	Boss Media	Information Technology	2.076	6.126	0.000	8.035	-0.006	0.491
2003	Broström	Industrials	3.296	6.291	0.517	1.322	0.056	0.579
2003	Bure Equity	Financials	2.623	5.542	0.552	0.339	-0.044	0.862
2003	Capio	Health Care	3.571	6.654	0.485	1.748	0.040	0.983
2003	Capona	Financials	14.934	6.101	0.564	1.481	0.053	0.127
2003	Cardo	Industrials	2.638	6.777	0.062	2.074	0.092	1.578
2003	Castellum	Financials	9.253	6.843	0.609	1.486	0.051	0.138
2003	Clas Ohlson	Consumer Discretionary	3.403	6.643	0.000	5.978	0.306	2.000
2003	Electrolux	Consumer Discretionary	3.030	7.672	0.162	1.709	0.101	1.652
2003	Elekta	Health Care	2.433	6.442	0.085	1.914	0.079	0.939
2003	Eniro	Consumer Discretionary	3.410	7.063	0.369	4.056	0.135	0.703
2003	Ericsson	Information Technology	2.228	8.310	0.235	3.376	0.023	0.758
2003	Finnveden	Materials	3.111	6.059	0.361	1.082	0.052	1.427
2003	Framfab	Information Technology	7.378	5.597	0.391	8.774	-0.242	1.640
2003	FöreningsSparbanken	Financials	3.461	7.873	0.563	1.782	0.009	0.057
2003	Gambro	Health Care	2.470	6.748	0.217	0.283	0.048	0.790
2003	Getinge	Health Care	3.231	7.114	0.350	3.682	0.108	0.807
2003	Gunnebo	Industrials	3.031	6.594	0.270	2.101	0.073	1.378
2003	H&M	Consumer Discretionary	3.779	8.110	0.000	6.414	0.359	1.879
2003	Haldex	Industrials	2.937	6.352	0.285	1.626	0.056	1.702
2003	Handelsbanken	Financials	3.990	7.980	0.546	1.681	0.009	0.046
2003	Hexagon	Industrials	2.773	6.534	0.318	1.505	0.063	1.226
2003	Holmen	Materials	3.226	7.166	0.137	0.961	0.074	0.607
2003	Hufvudstaden	Financials	8.949	6.837	0.343	1.434	0.042	0.125
2003	Höganäs	Materials	3.085	6.709	0.361	2.593	0.083	0.805
2003	IBS	Information Technology	3.687	6.007	0.185	1.786	0.020	1.788
2003	Intentia	Information Technology	2.999	5.884	0.137	0.920	-0.162	1.305
2003	Investor	Financials	2.878	7.497	0.371	0.640	0.008	0.039
2003	JM	Financials	1.691	6.473	0.277	0.906	0.014	0.852
2003	Kinnevik	Financials	0.737	6.490	0.527	0.861	-0.006	0.113
2003	Kungsleden	Financials	10.937	6.563	0.744	1.294	0.042	0.120
2003	Lindex	Consumer Discretionary	3.016	6.353	0.011	1.955	0.103	2.641
2003	Lundbergföretagen	Financials	3.745	6.947	0.191	0.734	0.065	0.396
2003	Lundin Petroleum	Energy	7.291	6.936	0.000	4.646	0.126	0.407
2003	Medivir	Health Care	-5.682	5.964	0.011	3.311	-0.369	0.484
2003	Micronic Laser Syst	Information Technology	0.963	6.515	0.323	4.096	-0.055	0.270
2003	MTG	Consumer Discretionary	3.183	6.365	0.253	1.080	0.100	1.185
2003	Munters	Industrials	3.297	6.628	0.163	3.907	0.127	1.860
2003	NCC	Industrials	3.236	6.383	0.261	0.391	0.027	1.530
2003	Nobel Biocare	Health Care	3.474	6.504	0.002	7.221	0.231	0.883
2003	Nobia	Consumer Discretionary	2.858	6.636	0.288	1.622	0.093	1.441
2003	Nokia	Information Technology	4.139	7.809	0.021	4.254	0.200	1.271
2003	Nordea	Financials	2.809	8.187	0.314	1.390	0.007	0.057
2003	Observer	Industrials	2.220	6.380	0.293	1.352	0.025	0.492
2003	OMX	Financials	2.138	7.015	0.324	2.927	0.015	0.424
2003	Orc Software	Information Technology	3.160	6.092	0.000	5.059	0.210	0.669
2003	Peab	Industrials	3.475	6.514	0.226	1.488	0.029	2.010
2003	Q-Med	Health Care	0.994	6.626	0.052	3.303	-0.033	0.414
2003	Ratos	Financials	1.228	6.811	0.040	0.827	-0.003	0.211
2003	Rottneros	Materials	1.198	6.189	0.021	0.900	-0.053	1.027
2003	SAAB	Industrials	3.001	7.038	0.133	1.557	0.052	0.622
2003	Sandvik	Industrials	2.910	7.792	0.222	2.892	0.112	1.040
2003	SAS	Industrials	2.792	7.049	0.481	0.852	-0.037	0.965
2003	SCA	Materials	2.681	7.754	0.236	1.140	0.054	0.796
2003	SCANIA	Industrials	3.382	7.307	0.400	1.112	0.078	0.826
2003	SEB	Financials	2.516	7.845	0.383	1.445	0.006	0.046

2003	Securitas	Industrials	5.287	7.528	0.385	3.013	0.073	1.659
2003	Skandia	Financials	2.581	7.428	0.012	1.895	0.007	0.197
2003	Skanska	Industrials	3.100	7.391	0.116	1.738	0.026	1.991
2003	SKF	Industrials	2.847	7.410	0.046	1.695	0.096	1.169
2003	Song Networks	Telecom. services	1.951	6.548	0.048	2.653	-0.014	0.771
2003	SSAB	Materials	2.594	6.981	0.193	0.955	0.072	1.068
2003	Stora Enso	Materials	2.631	6.846	0.289	0.868	0.027	0.679
2003	Swedish Match	Consumer Staples	3.862	7.383	0.362	6.018	0.147	0.877
2003	SwitchCore	Information Technology	-8.036	5.883	0.062	7.053	-0.330	0.626
2003	Tele2	Telecom. services	5.721	7.684	0.159	1.592	0.045	0.811
2003	Teleca	Information Technology	2.093	6.313	0.115	1.142	-0.018	0.932
2003	Telelogic	Information Technology	2.459	6.371	0.056	4.273	0.004	1.037
2003	TeliaSonera	Telecom. services	4.541	8.245	0.174	1.564	0.077	0.471
2003	TietoEnator	Information Technology	3.421	6.255	0.026	3.783	0.123	1.731
2003	Tornet	Financials	9.490	6.709	0.665	0.926	0.044	0.143
2003	Trelleborg	Industrials	2.427	6.942	0.430	1.174	0.032	0.805
2003	WM-data	Information Technology	3.602	6.723	0.062	3.229	0.057	1.758
2003	Volvo	Industrials	2.420	7.965	0.330	1.274	0.022	0.817
2002	Alfa Laval	Industrials	3.002	6.893	0.303	1.732	0.064	0.980
2002	Assa Abloy	Industrials	2.878	7.538	0.443	2.787	0.077	0.775
2002	AstraZeneca	Health Care	3.692	7.580	0.040	5.482	0.206	0.892
2002	Atlas Copco	Industrials	3.222	7.376	0.284	1.178	0.108	1.017
2002	Axfood	Consumer Staples	3.924	6.936	0.180	5.093	0.111	4.523
2002	Biacore	Health Care	2.709	6.254	0.005	2.827	0.169	0.761
2002	Billerud	Materials	3.760	6.740	0.281	1.702	0.175	1.028
2002	Boliden	Materials	2.887	6.092	0.528	0.477	0.028	0.914
2002	Broström	Industrials	3.558	6.015	0.548	0.739	0.056	0.454
2002	Bure Equity	Financials	3.757	6.035	0.463	1.077	-0.083	1.277
2002	Capio	Health Care	3.160	6.729	0.160	2.086	0.067	1.383
2002	Cardo	Industrials	2.619	6.782	0.047	1.564	0.099	1.733
2002	Castellum	Financials	12.086	6.699	0.620	1.119	0.075	0.164
2002	Clas Ohlson	Consumer Discretionary	3.320	6.721	0.000	9.061	0.277	2.029
2002	Electrolux	Consumer Discretionary	3.115	7.627	0.187	1.534	0.098	1.615
2002	Elekta	Health Care	2.466	6.441	0.015	2.172	0.089	1.145
2002	Eniro	Consumer Discretionary	3.151	6.986	0.285	2.610	0.105	0.663
2002	Ericsson	Information Technology	1.323	7.985	0.270	1.311	-0.066	0.793
2002	Europolitan	Telecom. services	6.168	7.306	0.006	4.658	0.264	0.856
2002	FöreningsSparbanken	Financials	3.222	7.735	0.575	1.408	0.008	0.064
2002	Gambro	Health Care	2.480	6.658	0.257	0.230	0.044	0.794
2002	Getinge	Health Care	3.172	6.923	0.288	2.654	0.113	0.965
2002	Gunnebo	Industrials	3.130	6.420	0.328	1.597	0.059	1.306
2002	H&M	Consumer Discretionary	3.695	8.145	0.000	7.308	0.330	1.820
2002	Haldex	Industrials	2.944	6.236	0.298	1.101	0.044	1.679
2002	Handelsbanken	Financials	3.763	7.877	0.569	1.445	0.008	0.050
2002	Hexagon	Industrials	2.843	6.381	0.345	1.097	0.062	1.134
2002	Holmen	Materials	3.408	7.084	0.164	0.805	0.083	0.601
2002	Höganäs	Materials	3.423	6.739	0.341	3.002	0.116	0.786
2002	IFS	Information Technology	5.187	5.459	0.285	0.672	-0.124	1.244
2002	Intentia	Information Technology	3.580	5.790	0.315	0.791	-0.122	1.241
2002	Intrum Justitia	Industrials	2.862	6.537	0.249	2.238	0.095	0.761
2002	Investor	Financials	4.732	7.379	0.292	0.485	0.022	0.053
2002	JM	Financials	2.054	6.679	0.353	1.337	0.036	0.835
2002	Karo Bio	Health Care	0.206	6.011	0.000	3.808	-0.858	0.507
2002	Kinnevik	Financials	-9.679	6.016	0.655	0.566	-0.028	0.129
2002	Kungsleden	Financials	11.747	6.439	0.714	1.190	0.048	0.209
2002	LGP Telecom	Telecom. services	2.289	6.032	0.113	1.028	0.019	0.914
2002	Lindex	Consumer Discretionary	3.045	6.365	0.142	2.139	0.090	2.216
2002	Lundbergföretagen	Financials	3.817	6.871	0.211	0.630	0.067	0.392
2002	Micronic Laser Syst	Information Technology	0.753	5.896	0.353	1.248	-0.071	0.389
2002	MTG	Consumer Discretionary	2.725	6.052	0.303	0.598	0.038	1.037
2002	Munters	Industrials	3.620	6.674	0.156	4.234	0.174	1.752
2002	NCC	Industrials	3.088	6.334	0.256	0.284	0.030	1.283
2002	Nobel Biocare	Health Care	3.408	6.349	0.098	7.235	0.223	0.987
2002	Nobia	Consumer Discretionary	2.982	6.571	0.224	1.437	0.119	1.688
2002	Nokia	Information Technology	4.293	7.860	0.025	5.078	0.217	1.328
2002	Nordea	Financials	2.685	8.051	0.098	1.036	0.006	0.062
2002	Observer	Industrials	2.371	6.364	0.353	1.187	0.042	0.471
2002	OMX	Financials	2.362	6.544	0.441	1.733	0.015	0.566
2002	Orc Software	Information Technology	3.970	6.001	0.000	4.089	0.314	0.717
2002	Pandox	Financials	10.639	6.260	0.589	0.980	0.037	0.119

2002	Peab	Industrials	3.194	6.566	0.179	1.338	0.059	2.037
2002	Perbio Science	Industrials	3.129	6.559	0.228	3.162	0.204	1.192
2002	Q-Med	Health Care	1.743	6.309	0.148	4.692	0.005	0.824
2002	Ratos	Financials	1.411	6.736	0.041	0.677	0.002	0.220
2002	Rottneros	Materials	1.750	6.135	0.003	0.799	-0.005	1.065
2002	SAAB	Industrials	2.876	6.983	0.152	1.406	0.036	0.616
2002	Sandvik	Industrials	2.827	7.687	0.236	2.096	0.109	0.992
2002	Sapa	Industrials	2.510	6.768	0.183	1.512	0.058	1.381
2002	SAS	Industrials	2.982	6.910	0.455	0.535	0.009	0.995
2002	SCA	Materials	2.889	7.744	0.252	1.156	0.072	0.808
2002	SCANIA	Industrials	3.311	7.227	0.449	0.995	0.058	0.778
2002	SEB	Financials	2.505	7.689	0.375	1.069	0.005	0.052
2002	Seco Tools	Industrials	3.289	6.653	0.151	2.242	0.182	1.069
2002	Securitas	Industrials	5.633	7.556	0.359	3.085	0.092	1.836
2002	Skandia	Financials	0.245	7.376	0.020	1.635	-0.005	0.191
2002	Skanska	Industrials	3.485	7.291	0.193	1.373	0.036	1.897
2002	SKF	Industrials	2.836	7.265	0.063	1.125	0.100	1.098
2002	Song Networks	Telecom. services	1.440	4.679	0.014	0.062	-0.378	0.961
2002	SSAB	Materials	2.403	6.885	0.208	0.783	0.044	1.047
2002	Stora Enso	Materials	2.973	6.841	0.285	0.849	0.051	0.704
2002	Swedish Match	Consumer Staples	4.018	7.370	0.361	5.847	0.156	0.895
2002	SwitchCore	Information Technology	1.574	5.481	0.033	4.354	-0.872	0.538
2002	Tele2	Telecom. services	5.718	7.462	0.225	1.009	0.034	0.686
2002	Teleca	Information Technology	2.107	6.238	0.088	0.875	0.036	0.731
2002	Telelogic	Information Technology	2.607	6.100	0.058	2.005	0.014	1.128
2002	TeliaSonera	Telecom. services	4.363	8.179	0.235	1.388	0.061	0.312
2002	TietoEnator	Information Technology	3.315	6.032	0.003	2.350	0.110	1.518
2002	Tornet	Financials	7.444	6.615	0.694	0.844	0.032	0.128
2002	Trelleborg	Industrials	2.370	6.757	0.228	0.785	0.041	1.187
2002	WM-Data	Information Technology	4.484	6.413	0.210	1.962	0.038	1.529
2002	Volvo	Industrials	2.294	7.775	0.313	0.761	0.012	0.804
2001	Allgon	Telecom. services	1.817	6.222	0.160	2.895	-0.118	1.443
2001	Assa Abloy	Industrials	2.780	7.703	0.472	4.265	0.063	0.656
2001	AstraZeneca	Health Care	3.728	7.734	0.054	8.056	0.215	0.934
2001	Atlas Copco	Industrials	3.221	7.516	0.317	1.190	0.098	0.823
2001	Axfood	Consumer Staples	4.040	6.796	0.267	5.177	0.058	4.188
2001	Biacore	Health Care	2.154	6.520	0.000	5.824	0.083	0.771
2001	Billerud	Materials	4.016	6.649	0.301	1.441	0.194	1.040
2001	Boliden	Materials	3.865	6.572	0.470	1.477	-0.025	0.937
2001	Boss Media	Information Technology	2.285	5.997	0.000	6.733	0.040	0.858
2001	Bure Equity	Financials	1.567	6.497	0.252	1.015	-0.029	0.517
2001	C Technologies	Information Technology	-0.077	6.446	0.006	3.496	-0.625	0.162
2001	Capio	Health Care	2.914	6.744	0.461	2.334	0.039	0.690
2001	Carnegie	Financials	3.273	6.941	0.101	4.648	0.045	0.199
2001	Castellum	Financials	8.267	6.648	0.656	1.158	0.045	0.136
2001	Electrolux	Consumer Discretionary	2.940	7.699	0.250	1.733	0.069	1.481
2001	Elekta	Health Care	2.468	6.218	0.132	2.438	0.035	1.048
2001	Enea Data	Information Technology	1.424	5.986	0.007	1.723	-0.300	1.113
2001	Eniro	Consumer Discretionary	3.057	7.121	0.276	2.655	0.083	0.505
2001	Ericsson	Information Technology	-0.018	8.654	0.298	6.573	-0.144	0.964
2001	Esselte	Consumer Discretionary	3.017	6.020	0.333	0.421	0.053	1.305
2001	Europolitan	Telecom. services	7.000	7.490	0.013	10.067	0.342	1.055
2001	Framfab	Information Technology	6.871	5.312	0.092	1.871	-1.931	2.021
2001	FöreningsSparbanken	Financials	3.429	7.836	0.599	1.831	0.008	0.068
2001	Gambro	Health Care	2.367	6.793	0.257	0.275	0.032	0.692
2001	Getinge	Health Care	3.182	6.908	0.360	2.743	0.104	0.887
2001	Gunnebo	Industrials	3.297	6.429	0.362	1.772	0.053	1.213
2001	H&M	Consumer Discretionary	3.315	8.192	0.004	10.081	0.273	1.975
2001	Handelsbanken	Financials	4.057	8.000	0.588	2.080	0.009	0.060
2001	HiQ	Information Technology	3.033	6.024	0.025	4.426	0.157	1.421
2001	Holmen	Materials	3.665	7.136	0.140	0.972	0.108	0.673
2001	Höganäs	Materials	3.304	6.738	0.395	3.133	0.103	0.742
2001	IFS	Information Technology	2.351	6.292	0.110	1.243	-0.075	1.033
2001	Intentia	Information Technology	3.671	6.349	0.289	2.630	-0.046	1.167
2001	Investor	Financials	16.040	7.715	0.239	0.980	0.116	0.143
2001	JM	Financials	3.051	6.820	0.423	1.727	0.080	0.671
2001	Karo Bio	Health Care	-4.237	6.630	0.000	7.655	-0.486	0.199
2001	Kinnevik	Financials	-3.845	6.365	0.605	1.000	-0.020	0.100
2001	Kungsleden	Financials	10.972	6.346	0.602	1.014	0.038	0.213
2001	LGP Telecom	Telecom. services	1.863	6.370	0.181	2.234	-0.019	0.760

2001	Lindex	Consumer Discretionary	2.685	6.164	0.284	1.501	0.026	2.028
2001	Lundin Oil	Energy	8.020	5.956	0.037	1.023	-0.024	0.001
2001	Micronic Laser Syst	Information Technology	1.670	6.564	0.329	5.266	0.012	0.525
2001	MTG	Consumer Discretionary	2.862	6.501	0.278	1.628	0.047	0.967
2001	Munters	Industrials	3.484	6.632	0.123	4.233	0.180	1.747
2001	NCC	Industrials	2.945	6.474	0.346	0.407	-0.011	1.172
2001	Nobel Biocare	Health Care	2.884	7.045	0.174	5.734	0.143	0.886
2001	Nokia	Information Technology	4.364	8.137	0.048	11.238	0.216	1.444
2001	Nordea	Financials	2.938	8.216	0.174	1.496	0.007	0.056
2001	OMX	Financials	1.833	7.064	0.376	5.138	-0.036	0.502
2001	Proffice	Industrials	6.957	6.385	0.000	6.137	0.013	2.473
2001	Q-Med	Health Care	1.807	6.634	0.087	9.731	0.030	0.596
2001	Ratos	Financials	2.202	6.729	0.023	0.655	0.014	0.231
2001	Rottneros	Materials	2.458	6.269	0.000	1.048	0.076	1.161
2001	SAAB	Industrials	2.803	6.998	0.192	1.490	0.027	0.553
2001	Sandvik	Industrials	2.783	7.764	0.215	2.423	0.111	1.008
2001	Sapa	Industrials	2.683	6.722	0.257	1.327	0.057	1.675
2001	SAS	Industrials	2.254	7.042	0.418	0.708	-0.027	0.827
2001	SAS	Industrials	2.254	7.042	0.418	0.708	-0.027	0.827
2001	SCA	Materials	3.101	7.724	0.260	1.152	0.087	0.771
2001	SCANIA	Industrials	5.522	7.835	0.370	5.734	0.075	1.641
2001	SEB	Financials	2.618	7.809	0.384	1.453	0.006	0.062
2001	Securitas	Industrials	5.522	7.835	0.370	5.734	0.075	1.641
2001	Skandia	Financials	2.098	7.891	0.029	3.820	0.003	0.166
2001	Skanska	Industrials	2.809	7.418	0.169	1.466	0.004	1.799
2001	SKF	Industrials	2.765	7.124	0.087	0.820	0.079	1.071
2001	Song Networks	Telecom. services	-2.640	6.172	0.553	0.650	-0.120	0.215
2001	SSAB	Materials	2.339	6.883	0.228	0.783	0.034	1.033
2001	Stora Enso	Materials	3.301	7.017	0.312	1.156	0.070	0.658
2001	Swedish Match	Consumer Staples	3.795	7.288	0.367	4.732	0.132	0.832
2001	SwitchCore	Information Technology	0.353	6.032	0.002	5.825	-0.945	0.077
2001	Tele2	Telecom. services	2.988	7.647	0.250	1.503	-0.031	0.529
2001	Teleca	Information Technology	3.340	6.307	0.282	2.330	0.076	1.739
2001	Telelogic	Information Technology	2.072	6.191	0.048	2.169	-1.582	1.182
2001	Telia	Telecom. services	2.495	8.147	0.230	2.340	-0.010	0.451
2001	TietoEnator	Information Technology	3.078	6.394	0.006	5.149	0.136	1.430
2001	Tornet	Financials	8.656	6.567	0.646	0.911	0.044	0.151
2001	Trelleborg	Industrials	2.307	6.779	0.250	0.781	0.026	1.099
2001	WM-Data	Information Technology	3.353	6.937	0.192	3.583	0.032	2.074
2001	Volvo	Industrials	2.098	7.868	0.322	0.867	0.004	0.748
2000	Adera	Information Technology	0.454	5.561	0.055	1.172	-0.929	1.014
2000	Allgon	Telecom. services	2.386	6.375	0.126	3.424	-0.012	1.618
2000	Assa Abloy	Industrials	2.563	7.789	0.365	5.732	0.063	0.561
2000	AssiDomän	Materials	2.884	7.352	0.099	0.905	0.073	0.613
2000	AstraZeneca	Health Care	3.673	7.774	0.046	9.324	0.203	0.855
2000	Atlas Copco	Industrials	3.294	7.461	0.367	1.205	0.104	0.777
2000	AU-System	Telecom. services	2.826	6.644	0.150	12.353	0.045	1.276
2000	Avesta	Industrials	2.128	6.730	0.163	0.658	0.036	1.026
2000	Biacore	Health Care	2.474	6.622	0.000	8.485	0.120	0.704
2000	Boss Media	Information Technology	4.666	6.470	0.000	19.714	0.306	0.814
2000	Bure Equity	Financials	1.723	6.750	0.059	1.289	-0.041	0.837
2000	C Technologies	Information Technology	0.287	6.663	0.004	9.149	-0.298	0.132
2000	Castellum	Financials	6.870	6.630	0.648	1.171	0.048	0.142
2000	Cell Network	Telecom. services	1.551	6.160	0.040	1.596	-0.160	0.832
2000	Elanders	Industrials	2.924	6.163	0.306	1.670	0.044	1.137
2000	Electrolux	Consumer Discretionary	3.160	7.608	0.291	1.541	0.093	1.439
2000	Enea Data	Information Technology	1.940	6.816	0.000	9.000	-0.020	0.827
2000	Eniro	Consumer Discretionary	3.742	7.154	0.265	5.945	0.149	0.628
2000	Ericsson	Information Technology	2.193	8.930	0.149	9.273	0.013	1.097
2000	Framfab	Information Technology	1.109	6.379	0.051	2.433	-1.421	0.983
2000	FöreningsSparbanken	Financials	3.458	7.882	0.576	2.182	0.009	0.069
2000	Gambro	Health Care	2.405	6.803	0.202	0.290	0.043	0.610
2000	Getinge	Health Care	3.174	6.678	0.381	2.469	0.087	0.682
2000	H&M	Consumer Discretionary	3.119	8.091	0.003	10.381	0.240	1.940
2000	Handelsbanken	Financials	3.936	8.020	0.564	2.456	0.009	0.073
2000	HiQ	Information Technology	3.073	6.480	0.021	14.488	0.211	1.295
2000	Holmen	Materials	3.174	7.206	0.069	0.944	0.075	0.621
2000	Höganäs	Materials	3.670	6.676	0.205	2.636	0.157	0.857
2000	IBS	Information Technology	2.867	6.159	0.105	1.906	-0.031	1.484
2000	IFS	Information Technology	1.818	6.205	0.179	1.235	-0.176	0.835

2000	Intentia	Information Technology	5.765	6.281	0.510	5.382	-0.118	1.153
2000	JM	Financials	2.971	6.837	0.446	1.824	0.077	0.600
2000	Karo Bio	Health Care	-2.976	6.549	0.000	3.928	-0.232	0.115
2000	Kinnevik	Financials	4.885	6.489	0.192	1.330	-0.026	0.104
2000	LGP Telecom	Telecom. services	3.361	6.811	0.163	6.966	0.128	0.879
2000	Lindex	Consumer Discretionary	3.135	6.439	0.169	2.877	0.133	1.901
2000	Lundbergföretagen	Financials	10.030	6.799	0.173	0.738	0.071	0.119
2000	M2S Sverige	Information Technology	1.058	6.015	0.032	1.567	-0.060	0.381
2000	Micronic Laser Syst	Information Technology	2.326	6.727	0.071	7.888	0.089	0.748
2000	Modul 1 Data	Information Technology	2.864	5.715	0.003	3.191	-0.091	1.582
2000	MTG	Consumer Discretionary	2.834	6.690	0.213	1.996	0.035	0.824
2000	NCC	Industrials	2.451	6.481	0.293	0.303	0.016	1.055
2000	Net Insight	Information Technology	-1.156	5.989	0.000	5.487	-1.055	0.044
2000	NetCom	Telecom. services	3.478	7.653	0.208	1.688	0.002	0.294
2000	Nobel Biocare	Health Care	2.675	6.865	0.241	4.831	0.113	0.894
2000	Nokia	Information Technology	4.801	8.348	0.066	20.621	0.282	1.559
2000	Nordea	Financials	3.577	8.329	0.179	2.166	0.010	0.051
2000	Observer	Industrials	2.440	6.496	0.258	2.007	0.069	0.429
2000	OMX	Financials	3.008	7.292	0.010	6.557	0.117	0.502
2000	Perstorp	Industrials	2.664	6.619	0.214	1.056	0.065	1.169
2000	Proffice	Industrials	6.241	6.627	0.000	10.352	0.105	2.426
2000	Protect Data	Information Technology	1.586	6.067	0.000	5.353	-0.004	1.011
2000	Ratos	Financials	10.475	6.657	0.013	0.669	0.139	0.355
2000	Sandvik	Industrials	2.829	7.769	0.140	2.613	0.120	0.996
2000	Sapa	Industrials	3.071	6.704	0.346	1.457	0.070	1.251
2000	SCA	Materials	3.068	7.529	0.222	0.836	0.089	0.799
2000	SCANIA	Industrials	3.445	7.322	0.467	1.338	0.081	0.960
2000	SEB	Financials	2.409	7.846	0.399	1.684	0.005	0.062
2000	Securitas	Industrials	4.670	7.773	0.436	5.962	0.056	1.226
2000	Skandia	Financials	2.380	8.196	0.016	7.660	0.005	0.261
2000	Skanska	Industrials	2.634	7.580	0.144	2.070	0.033	1.400
2000	SKF	Industrials	2.862	6.964	0.134	0.677	0.076	1.066
2000	SSAB	Materials	2.524	6.831	0.212	0.699	0.054	0.998
2000	Stora Enso	Materials	3.584	6.956	0.322	1.053	0.082	0.608
2000	Svedala	Industrials	2.534	6.888	0.390	1.873	0.029	1.058
2000	Swedish Match	Consumer Staples	3.323	7.108	0.362	2.157	0.094	0.565
2000	SwitchCore	Information Technology	-0.086	6.318	0.018	14.710	-0.929	0.007
2000	Technology Nexus	Information Technology	1.897	6.002	0.000	2.707	0.025	0.772
2000	Telelogic	Information Technology	1.335	6.822	0.022	2.843	-0.016	0.287
2000	Telia	Telecom. services	2.844	8.163	0.285	2.600	0.039	0.453
2000	Teligent AB	Telecom. services	0.890	6.145	0.000	3.201	-0.072	0.497
2000	TietoEnator	Information Technology	3.335	6.397	0.012	7.004	0.108	1.787
2000	Tornet	Financials	6.320	6.652	0.664	1.145	0.025	0.130
2000	Trelleborg	Industrials	2.140	6.804	0.178	0.744	0.034	0.827
2000	TurnIT	Information Technology	1.752	6.220	0.208	1.259	-0.006	0.680
2000	WM-Data	Information Technology	3.172	7.173	0.166	6.000	-0.005	1.792
2000	Volvo	Industrials	2.276	7.794	0.332	0.704	0.028	0.653
1999	ABB	Industrials	3.007	7.767	0.206	6.536	0.030	0.868
1999	AGA	Energy	3.194	7.158	0.368	1.638	0.057	0.598
1999	Allgon	Telecom. services	2.684	6.672	0.172	6.768	0.078	1.547
1999	Assa Abloy	Industrials	2.776	7.549	0.244	6.627	0.100	0.937
1999	AssiDomän	Materials	2.602	7.215	0.276	1.243	0.038	0.808
1999	AstraZeneca	Health Care	3.628	7.659	0.058	7.161	0.188	0.914
1999	Atlas Copco	Industrials	2.931	7.546	0.370	1.685	0.081	0.699
1999	Atle	Industrials	1.839	6.880	0.167	1.573	0.003	0.733
1999	Avesta	Industrials	0.618	6.697	0.094	0.700	-0.103	1.242
1999	Beijer	Industrials	2.524	5.735	0.306	1.278	0.056	1.408
1999	Bergman & Beving	Industrials	2.615	6.440	0.113	1.514	0.080	1.783
1999	Bilia	Consumer Discretionary	2.885	6.376	0.378	1.520	0.028	2.325
1999	BT Industries	Industrials	3.026	6.683	0.436	1.972	0.063	1.126
1999	Bure Equity	Financials	2.081	6.801	0.399	1.561	-0.017	1.359
1999	Cardo	Industrials	3.140	6.706	0.225	1.930	0.117	1.426
1999	Castellum	Financials	7.536	6.618	0.539	1.046	0.038	0.130
1999	Consilium	Industrials	2.296	5.150	0.352	1.038	-0.046	1.286
1999	Electrolux	Consumer Discretionary	3.106	7.882	0.290	2.956	0.091	1.481
1999	Elekta	Health Care	1.566	5.442	0.302	0.515	-0.076	0.948
1999	Ericsson	Information Technology	2.776	9.030	0.176	15.476	0.073	1.043
1999	Esselte	Consumer Discretionary	2.792	6.087	0.360	0.470	0.006	1.215
1999	Finnveden	Materials	2.789	6.114	0.311	1.285	0.076	1.196
1999	FöreningsSparbanken	Financials	2.809	7.819	0.597	2.128	0.006	0.057

1999	Gambro	Health Care	2.458	6.860	0.136	0.369	0.049	0.585
1999	Getinge	Health Care	3.474	6.609	0.380	2.607	0.156	1.128
1999	Geveko	Financials	1.837	5.696	0.201	1.060	0.021	0.591
1999	Gränges	Industrials	2.984	6.813	0.215	2.360	0.083	1.388
1999	H&M	Consumer Discretionary	3.623	8.295	0.003	19.156	0.336	1.964
1999	Haldex	Industrials	3.026	6.344	0.293	1.481	0.098	1.546
1999	Handelsbanken	Financials	3.934	7.842	0.652	1.803	0.009	0.070
1999	Hexagon	Industrials	2.544	6.273	0.223	1.342	0.044	1.546
1999	Hufvudstaden	Financials	7.153	6.680	0.480	1.447	0.024	0.125
1999	Höganäs	Materials	3.995	6.839	0.088	3.731	0.198	0.841
1999	IBS	Information Technology	3.859	6.530	0.169	6.273	0.108	1.677
1999	Intentia	Information Technology	2.383	6.758	0.417	8.928	-0.244	1.057
1999	Investor	Financials	17.023	7.738	0.297	1.160	0.096	0.576
1999	JM	Financials	3.557	6.720	0.486	1.669	0.090	0.557
1999	Kalmar Industries	Industrials	2.873	6.325	0.222	1.821	0.082	1.685
1999	Lindab	Industrials	2.901	6.318	0.243	1.654	0.118	1.381
1999	Lindex	Consumer Discretionary	3.121	6.458	0.167	3.636	0.131	2.058
1999	Lundin Oil	Energy	10.232	6.324	0.198	1.423	0.050	0.268
1999	Midway	Industrials	3.155	5.568	0.412	0.768	0.042	1.357
1999	Mo & Domsjö	Materials	2.894	7.308	0.235	1.280	0.065	0.703
1999	NCC	Industrials	2.482	6.652	0.254	0.458	0.033	1.290
1999	NetCom	Telecom. services	6.177	7.710	0.346	7.323	0.072	0.558
1999	Nobel Biocare	Health Care	2.897	6.476	0.268	2.285	0.100	0.803
1999	Nokia	Information Technology	4.304	8.321	0.076	28.378	0.255	1.410
1999	Nolato	Industrials	3.296	6.443	0.160	3.783	0.135	1.377
1999	Nordea	Financials	3.888	8.019	0.175	2.210	0.013	0.060
1999	Norrporten	Financials	11.360	5.981	0.597	0.915	0.047	0.135
1999	OMX	Financials	3.200	7.190	0.124	5.517	0.120	0.474
1999	Perstorp	Industrials	2.900	6.697	0.246	1.319	0.087	1.267
1999	Piren	Financials	5.537	6.389	0.618	1.117	0.018	0.089
1999	SAAB	Industrials	2.831	6.914	0.181	1.742	0.026	0.328
1999	SCA	Materials	2.900	7.627	0.339	1.242	0.073	0.762
1999	Scandiaconsult	Industrials	5.392	5.818	0.028	2.832	0.126	2.303
1999	Scandic Hotels	Financials	3.027	6.702	0.071	2.854	0.112	1.762
1999	SCANIA	Industrials	3.600	7.486	0.472	2.262	0.091	0.947
1999	Scribona	Consumer Discretionary	2.552	5.939	0.117	1.205	0.036	2.954
1999	SEB	Financials	2.564	7.734	0.374	1.641	0.007	0.057
1999	Seco Tools	Industrials	3.141	6.669	0.071	2.491	0.176	0.956
1999	Securitas	Industrials	3.514	7.718	0.267	5.827	0.062	1.289
1999	Skandia	Financials	2.624	8.119	0.020	7.483	0.006	0.330
1999	Skanska	Industrials	2.674	7.521	0.094	2.026	0.058	1.555
1999	SKF	Industrials	2.924	7.126	0.177	1.176	0.053	1.081
1999	Spendrups	Consumer Staples	3.361	5.451	0.213	0.757	0.070	1.543
1999	SSAB	Materials	2.155	7.034	0.157	1.115	0.017	0.974
1999	Stena Line	Industrials	2.686	5.616	0.657	0.191	-0.001	0.728
1999	Stora Enso	Materials	3.319	6.979	0.360	1.602	0.072	0.664
1999	Svedala	Industrials	2.671	6.874	0.361	1.754	0.064	1.132
1999	Swedish Match	Consumer Staples	3.323	7.108	0.362	2.157	0.094	0.565
1999	Sydkraft	Energy	3.881	7.341	0.404	1.058	0.063	0.277
1999	TietoEnator	Information Technology	3.440	6.359	0.010	6.471	0.115	1.787
1999	Trelleborg	Industrials	2.177	6.906	0.127	0.875	0.056	1.815
1999	TV4	Consumer Discretionary	3.030	6.571	0.000	4.990	0.140	1.454
1999	WM-Data	Information Technology	3.605	7.512	0.157	12.882	0.144	1.915
1999	Volvo	Industrials	2.284	7.987	0.275	0.994	0.034	0.645
1999	Ångpanneföreningen	Information Technology	4.465	5.852	0.243	2.137	0.039	1.594
1998	ABB	Industrials	3.142	7.365	0.192	2.755	0.028	0.941
1998	AGA	Energy	2.956	7.082	0.238	0.989	0.055	0.579
1998	Allgon	Telecom. services	2.905	6.317	0.037	3.585	0.142	1.827
1998	ASG	Industrials	2.654	6.244	0.026	1.055	0.023	2.775
1998	AstraZeneca	Health Care	3.563	7.703	0.012	0.920	0.182	0.751
1998	Atlas Copco	Industrials	3.022	7.339	0.280	1.428	0.109	0.924
1998	Atle	Industrials	2.138	6.758	0.209	1.311	0.025	0.988
1998	Avesta	Industrials	1.556	6.898	0.111	0.951	-0.020	1.250
1998	Bilia	Consumer Discretionary	2.640	6.245	0.418	1.112	0.019	2.280
1998	BT Industries	Industrials	3.098	6.519	0.479	1.630	0.057	1.087
1998	BTL	Industrials	3.313	6.340	0.339	0.961	0.050	1.889
1998	Bure Equity	Financials	1.952	6.797	0.176	1.510	0.009	1.318
1998	Cardo	Industrials	2.932	6.603	0.274	1.688	0.067	1.160
1998	Castellum	Financials	7.046	6.643	0.527	1.178	0.035	0.143
1998	Celsius	Industrials	2.846	6.440	0.141	0.815	0.022	1.140

1998	Dahl International	Industrials	2.906	6.221	0.267	1.204	0.087	2.725
1998	Elanders	Industrials	3.238	6.023	0.273	1.852	0.100	1.231
1998	Electrolux	Consumer Discretionary	3.066	7.696	0.350	2.030	0.072	1.415
1998	Enator	Information Technology	3.794	6.880	0.001	5.748	0.105	1.979
1998	Enea Data	Information Technology	3.770	6.027	0.152	9.591	0.109	1.787
1998	Ericsson	Information Technology	2.954	8.576	0.114	5.967	0.107	1.089
1998	Esselte	Consumer Discretionary	2.905	6.303	0.379	0.590	0.058	1.096
1998	Europolitan	Telecom. services	7.450	7.512	0.311	26.049	0.370	1.165
1998	Finnveden	Materials	2.856	6.121	0.231	1.704	0.111	1.185
1998	FöreningsSparbanken	Financials	2.735	7.869	0.607	2.562	0.006	0.072
1998	Gambro	Health Care	2.358	6.918	0.085	0.464	0.029	0.561
1998	Getinge	Health Care	3.682	6.714	0.433	4.235	0.144	0.996
1998	Gränges	Industrials	2.936	6.632	0.166	1.707	0.086	1.559
1998	H&M	Consumer Discretionary	3.423	8.040	0.004	13.054	0.301	1.968
1998	Haldex	Industrials	3.088	6.262	0.312	1.364	0.098	1.309
1998	Handelsbanken	Financials	3.854	7.870	0.672	2.166	0.008	0.072
1998	Hexagon	Industrials	2.883	6.367	0.265	1.716	0.087	1.501
1998	Hufvudstaden	Financials	5.485	6.582	0.581	1.306	0.021	0.107
1998	Höganäs	Materials	3.778	6.694	0.142	3.151	0.179	0.867
1998	IBS	Information Technology	3.810	6.370	0.134	5.013	0.119	1.582
1998	Intentia	Information Technology	1.562	6.785	0.101	6.027	-0.156	1.084
1998	Investor	Financials	6.095	7.611	0.300	1.071	0.037	0.410
1998	Kalmar Industries	Industrials	2.965	6.306	0.268	1.782	0.084	1.678
1998	Lindab	Industrials	2.949	6.266	0.259	1.626	0.123	1.375
1998	Lindex	Consumer Discretionary	3.239	6.533	0.219	5.314	0.134	2.033
1998	Lundin Oil	Energy	4.826	6.160	0.256	1.146	-0.014	0.230
1998	Mandator	Telecom. services	3.974	6.385	0.001	11.449	0.157	1.601
1998	Mo & Domsjö	Materials	2.804	7.068	0.140	0.636	0.061	0.745
1998	N&T Argonaut	Industrials	8.616	5.911	0.490	0.336	0.025	0.224
1998	NCC	Industrials	2.337	6.445	0.248	0.288	0.026	1.200
1998	Netcom Systems	Telecom. services	4.283	7.452	0.515	8.673	0.041	0.610
1998	Nobel Biocare	Health Care	2.245	6.435	0.230	2.285	0.059	0.655
1998	Nokia	Information Technology	4.038	7.777	0.103	11.703	0.246	1.354
1998	Nolato	Industrials	3.406	6.296	0.169	3.275	0.139	1.462
1998	Nordea	Financials	3.834	8.218	0.137	3.644	0.013	0.066
1998	Perstorp	Industrials	2.682	6.672	0.193	1.037	0.072	1.244
1998	Pricer	Information Technology	4.126	5.659	0.342	1.957	-0.458	0.519
1998	Ratos	Financials	6.632	6.532	0.139	0.990	0.118	0.343
1998	Rottneros	Materials	0.402	5.823	0.032	0.546	-0.113	1.087
1998	SAAB	Industrials	2.713	6.929	0.168	2.108	0.013	0.266
1998	SCA	Materials	2.941	7.379	0.329	0.843	0.071	0.782
1998	Scandic Hotels	Financials	3.154	6.802	0.094	4.012	0.112	1.708
1998	SCANIA	Industrials	3.324	7.176	0.433	1.266	0.074	1.050
1998	SEB	Financials	2.314	7.682	0.499	1.580	0.005	0.089
1998	Securitas	Industrials	3.433	7.589	0.315	7.252	0.056	0.919
1998	Segerström & Sv.	Industrials	3.144	6.031	0.189	3.383	0.062	1.952
1998	Skandia	Financials	2.328	7.802	0.023	4.643	0.006	0.310
1998	Skanska	Industrials	2.718	7.372	0.122	1.743	0.060	1.453
1998	SKF	Industrials	2.471	6.786	0.217	0.558	-0.033	0.997
1998	SSAB	Materials	2.413	6.803	0.151	0.638	0.060	1.041
1998	Svedala	Industrials	2.817	6.753	0.341	1.339	0.082	1.177
1998	Swedish Match	Consumer Staples	3.920	7.105	0.445	5.891	0.126	0.781
1998	Sydkraft	Energy	4.116	7.398	0.402	1.269	0.077	0.294
1998	Tornet	Financials	6.068	6.544	0.641	0.884	0.024	0.138
1998	Trelleborg	Industrials	2.008	6.842	0.214	0.633	0.032	1.325
1998	WM-Data	Information Technology	3.565	7.330	0.167	10.280	0.139	1.950
1998	Volvo	Industrials	2.709	7.914	0.317	1.207	0.044	1.042

Exhibit 1 - Sample by industry

	98	99	00	01	02	03	04	05	06	07	Tot.	%
Consumer discre.	5	7	5	6	7	8	9	10	10	15	82	10.0%
Consumer staples	1	2	1	2	2	2	3	3	3	3	22	2.7%
Energy	3	3	0	1	0	1	1	1	2	3	15	1.8%
Financials	12	15	13	15	16	17	17	18	18	22	163	19.8%
Health care	4	5	6	9	9	10	8	8	6	6	71	8.6%
Industrials	29	30	17	17	25	21	22	24	25	24	234	28.4%
Information tech.	8	7	22	15	11	13	16	16	10	8	126	15.3%
Materials	6	7	6	8	8	9	8	7	8	8	75	9.1%
Telecom. services	4	2	7	6	5	3	2	2	2	2	35	4.3%
Total	*72*	*78*	*77*	*79*	*83*	*84*	*86*	*89*	*84*	*91*	*823*	*100.0%*

Exhibit 2 - Correlation matrix

	VAIC	FSIZE	DEBT
VAIC	1.0000	0.0909	0.3027
FSIZE	0.0909	1.0000	0.0803
DEBT	0.3027	0.0803	1.0000

Exhibit 3 - Missing values

	98	99	00	01	02	03	04	05	06	07	Tot.
Consumer discre.	1	1	1	2	3	4	3	2	2	1	20
Consumer staples	0	2	0	0	1	0	0	0	1	1	5
Energy	0	0	0	1	1	1	1	1	1	2	8
Financials	7	9	5	5	6	7	4	2	3	0	48
Health care	4	1	3	2	2	2	2	1	2	0	19
Industrials	7	7	3	7	3	1	1	2	3	3	37
Information tech.	7	0	6	2	0	0	0	1	2	0	18
Materials	2	1	1	1	0	0	0	1	1	1	8
Telecom. services	0	1	4	1	1	1	3	1	1	1	14
Total	*28*	*22*	*23*	*21*	*17*	*16*	*14*	*11*	*16*	*9*	*177*

Exhibit 4 - Panel regressions by industry with VAIC as explanatory variable

Dependent variable: MB

Consumer discr.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	1.2133	0.9613	1.2621	0.2071
VAIC	0.9367	0.2305	4.064	0.0001
R^2	0.1644			
Observations	82			
Cross-sections	19			
Total pool obs.	1539			

Industrials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.5230	0.4929	1.0611	0.2887
VAIC	0.5671	0.1640	3.4574	0.0005
R^2	0.1722			
Observations	234			
Cross-sections	53			
Total pool obs.	12296			

Consumer staples	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-16.9932	4.6139	-3.6831	0.0004
VAIC	5.9913	1.2290	4.8751	0.0000
R^2	0.8202			
Observations	22			
Cross-sections	5			
Total pool obs.	110			

Information tech.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	4.6357	0.6088	7.6142	0.0000
VAIC	0.2906	0.2130	1.3647	0.1724
R^2	0.0131			
Observations	126			
Cross-sections	34			
Total pool obs.	4284			

Energy	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	1.2873	0.6602	1.9498	0.0546
VAIC	0.1312	0.0826	1.5878	0.1161
R^2	0.1615			
Observations	15			
Cross-sections	6			
Total pool obs.	90			

Materials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.3441	0.3479	-0.9889	0.3230
VAIC	0.5963	0.1261	4.7280	0.0000
R^2	0.3074			
Observations	75			
Cross-sections	12			
Total pool obs.	900			

Financials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	2.0353	0.2070	9.8314	0.0000
VAIC	-0.0388	0.0293	-1.3229	0.1859
R^2	0.0196			
Observations	163			
Cross-sections	31			
Total pool obs.	4836			

Telecom. services	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.6531	1.6381	0.3987	0.6903
VAIC	0.9297	0.5715	1.6269	0.1045
R^2	0.1404			
Observations	35			
Cross-sections	12			
Total pool obs.	420			

Health care	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	4.0080	0.4890	8.1962	0.0000
VAIC	0.0250	0.1626	0.1536	0.8780
R^2	0.0003			
Observations	71			
Cross-sections	14			
Total pool obs.	994			

Dependent variable: ROA

Consumer discr.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.0473	0.0650	0.7278	0.4668
VAIC	0.0277	0.0183	1.5126	0.1306
R^2	0.1242			
Observations	82			
Cross-sections	19			
Total pool obs.	1539			

Industrials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.0675	0.0239	2.8291	0.0047
VAIC	0.0023	0.0077	0.2945	0.7684
R^2	0.0023			
Observations	234			
Cross-sections	53			
Total pool obs.	12296			

Consumer staples	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.1664	0.0654	-2.5429	0.0125
VAIC	0.0802	0.0191	4.2020	0.0001
R^2	0.5759			
Observations	22			
Cross-sections	5			
Total pool obs.	110			

Information tech.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.1637	0.0747	-2.1913	0.0285
VAIC	0.0448	0.0268	1.6701	0.0950
R^2	0.0563			
Observations	126			
Cross-sections	34			
Total pool obs.	4284			

Energy	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.0109	0.0236	-0.4637	0.6441
VAIC	0.0119	0.0026	4.5918	0.0000
R^2	0.5279			
Observations	15			
Cross-sections	6			
Total pool obs.	90			

Materials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.1513	0.0112	-13.5363	0.0000
VAIC	0.0760	0.0046	16.5228	0.0000
R^2	0.7584			
Observations	75			
Cross-sections	12			
Total pool obs.	900			

Financials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.0173	0.0045	3.8740	0.0001
VAIC	0.0029	0.0005	5.6210	0.0000
R^2	0.1200			
Observations	163			
Cross-sections	31			
Total pool obs.	4836			

Telecom. services	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.1301	0.0454	-2.8633	0.0044
VAIC	0.0478	0.0110	4.3639	0.0000
R^2	0.5200			
Observations	35			
Cross-sections	12			
Total pool obs.	420			

Health care	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.1938	0.0676	-2.8667	0.0042
VAIC	0.0960	0.0217	4.4316	0.0000
R^2	0.5177			
Observations	71			
Cross-sections	14			
Total pool obs.	994			

Dependent variable: ATO

Consumer discr.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	1.8296	0.1418	12.9026	0.0000
VAIC	-0.0740	0.0330	-2.2397	0.0253
R^2	0.0282			
Observations	82			
Cross-sections	19			
Total pool obs.	1539			

Industrials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.7980	0.1095	7.2906	0.0000
VAIC	0.1333	0.0353	3.7799	0.0002
R^2	0.1084			
Observations	234			
Cross-sections	53			
Total pool obs.	12296			

Consumer staples	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	2.7508	1.1919	2.3078	0.0230
VAIC	-0.1259	0.2602	-0.4839	0.6295
R^2	0.0039			
Observations	22			
Cross-sections	5			
Total pool obs.	110			

Information tech.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.6994	0.1055	6.6277	0.0000
VAIC	0.1505	0.0336	4.4820	0.0000
R^2	0.3267			
Observations	126			
Cross-sections	34			
Total pool obs.	4284			

Energy	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.3505	0.0883	3.9690	0.0002
VAIC	-0.0014	0.0080	-0.1736	0.8626
R^2	0.0018			
Observations	15			
Cross-sections	6			
Total pool obs.	90			

Materials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.5959	0.1734	3.4364	0.0006
VAIC	0.1058	0.0627	1.6875	0.0919
R^2	0.0639			
Observations	75			
Cross-sections	12			
Total pool obs.	900			

Financials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.3383	0.0553	6.1153	0.0000
VAIC	-0.0113	0.0072	-1.5565	0.1196
R^2	0.0187			
Observations	163			
Cross-sections	31			
Total pool obs.	4836			

Telecom. services	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.7881	0.1617	4.8727	0.0000
VAIC	0.0093	0.0335	0.2785	0.7808
R^2	0.0021			
Observations	35			
Cross-sections	12			
Total pool obs.	420			

Health care	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.5166	0.0676	7.6392	0.0000
VAIC	0.0915	0.0233	3.9274	0.0001
R^2	0.3538			
Observations	71			
Cross-sections	14			
Total pool obs.	994			

Exhibit 5 - Panel regressions by industry with VAIC and control variables as explanatory variables

Dependent variable: MB

Consumer discr.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-11.8808	5.1529	-2.3057	0.0213
VAIC	1.0010	0.2410	4.1529	0.0000
FSIZE	1.9660	0.7794	2.5226	0.0118
DEBT	-4.5039	2.2545	-1.9978	0.0460
R^2	0.3324			
Observations	82			
Cross-sections	19			
Total pool obs.	1539			

Industrials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-4.5241	0.9799	-4.6169	0.0000
VAIC	0.5958	0.1461	4.0764	0.0000
FSIZE	0.7693	0.1486	5.1782	0.0000
DEBT	-1.5978	0.8088	-1.9755	0.0482
R^2	0.2682			
Observations	234			
Cross-sections	53			
Total pool obs.	12296			

Consumer staples	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-18.9565	7.0673	-2.6823	0.0085
VAIC	5.9721	1.2698	4.7030	0.0000
FSIZE	0.2718	0.9814	0.2769	0.7824
DEBT	0.5371	3.3714	0.1593	0.8737
R^2	0.8211			
Observations	22			
Cross-sections	5			
Total pool obs.	110			

Information tech.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-7.7617	3.9009	-1.9897	0.0467
VAIC	0.3477	0.2276	1.5277	0.1267
FSIZE	2.0324	0.5968	3.4054	0.0007
DEBT	-10.1619	3.4667	-2.9313	0.0034
R^2	0.1999			
Observations	126			
Cross-sections	34			
Total pool obs.	4284			

Energy	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-7.1320	3.6435	-1.9575	0.0537
VAIC	0.1016	0.0611	1.6624	0.1003
FSIZE	1.3373	0.5795	2.3075	0.0236
DEBT	-2.7636	3.0057	-0.9194	0.3606
R^2	0.3103			
Observations	15			
Cross-sections	6			
Total pool obs.	90			

Materials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	3.1854	1.0457	3.0461	0.0024
VAIC	0.6925	0.1315	5.2679	0.0000
FSIZE	-0.5510	0.1889	-2.9169	0.0036
DEBT	0.0297	0.7326	0.0406	0.9676
R^2	0.3880			
Observations	75			
Cross-sections	12			
Total pool obs.	900			

Financials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.2772	0.8662	-0.3200	0.7490
VAIC	0.0018	0.0226	0.0812	0.9353
FSIZE	0.4092	0.1211	3.3784	0.0007
DEBT	-2.2461	0.5583	-4.0229	0.0001
R^2	0.1816			
Observations	163			
Cross-sections	31			
Total pool obs.	4836			

Telecom. services	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	18.1894	7.5779	2.4003	0.0168
VAIC	1.8633	0.8288	2.2482	0.0251
FSIZE	-3.2234	1.4606	-2.2069	0.0279
DEBT	12.5615	7.6336	1.6456	0.1006
R^2	0.3188			
Observations	35			
Cross-sections	12			
Total pool obs.	420			

Health care	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-5.0062	4.0749	-1.2286	0.2195
VAIC	-0.0100	0.1796	-0.0555	0.9558
FSIZE	1.4869	0.6254	2.3775	0.0176
DEBT	-6.1660	1.7020	-3.6228	0.0003
R^2	0.1977			
Observations	71			
Cross-sections	14			
Total pool obs.	994			

Dependent variable: ROA

Consumer discr.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.2041	0.1227	-1.6640	0.0964
VAIC	0.0255	0.0151	1.6874	0.0918
FSIZE	0.0368	0.0144	2.5613	0.0105
DEBT	-0.1167	0.0594	-1.9654	0.0496
R^2	0.2619			
Observations	82			
Cross-sections	19			
Total pool obs.	1539			

Industrials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.0676	0.0409	-1.6548	0.0980
VAIC	0.0030	0.0074	0.4114	0.6808
FSIZE	0.0206	0.0059	3.5156	0.0004
DEBT	-0.0430	0.0255	-1.6851	0.0920
R^2	0.0706			
Observations	234			
Cross-sections	53			
Total pool obs.	12296			

Consumer staples	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.1009	0.2667	0.3784	0.7059
VAIC	0.0817	0.0149	5.5027	0.0000
FSIZE	-0.0370	0.0369	-1.0027	0.3184
DEBT	-0.0587	0.0326	-1.7999	0.0748
R^2	0.6373			
Observations	22			
Cross-sections	5			
Total pool obs.	110			

Information tech.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-1.0809	0.2606	-4.1482	0.0000
VAIC	0.0415	0.0255	1.6244	0.1044
FSIZE	0.1414	0.0391	3.6117	0.0003
DEBT	-0.0605	0.1938	-0.3124	0.7548
R^2	0.1648			
Observations	126			
Cross-sections	34			
Total pool obs.	4284			

Energy	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.5226	0.1560	-3.3492	0.0012
VAIC	0.0120	0.0021	5.7905	0.0000
FSIZE	0.0712	0.0245	2.9109	0.0047
DEBT	0.0802	0.0903	0.8874	0.3775
R^2	0.7489			
Observations	15			
Cross-sections	6			
Total pool obs.	90			

Materials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.1132	0.0412	-2.7490	0.0061
VAIC	0.0797	0.0054	14.6642	0.0000
FSIZE	-0.0015	0.0070	-0.2184	0.8272
DEBT	-0.1598	0.0437	-3.6552	0.0003
R^2	0.8237			
Observations	75			
Cross-sections	12			
Total pool obs.	900			

Financials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.1096	0.0347	3.1541	0.0016
VAIC	0.0037	0.0007	5.2921	0.0000
FSIZE	-0.0096	0.0042	-2.3161	0.0206
DEBT	-0.0706	0.0181	-3.8903	0.0001
R^2	0.2584			
Observations	163			
Cross-sections	31			
Total pool obs.	4836			

Telecom. services	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.2699	0.2379	-1.1345	0.2572
VAIC	0.0414	0.0130	3.1724	0.0016
FSIZE	0.0235	0.0354	0.6623	0.5082
DEBT	-0.0302	0.1421	-0.2123	0.8320
R^2	0.5332			
Observations	35			
Cross-sections	12			
Total pool obs.	420			

Health care	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.8162	0.3151	-2.5901	0.0097
VAIC	0.0866	0.0207	4.1798	0.0000
FSIZE	0.0991	0.0452	2.1945	0.0284
DEBT	-0.1863	0.0984	-1.8932	0.0586
R^2	0.5694			
Observations	71			
Cross-sections	14			
Total pool obs.	994			

Dependent variable: ATO

Consumer discr.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	3.1782	0.9763	3.2554	0.0012
VAIC	-0.0511	0.0314	-1.6251	0.1044
FSIZE	-0.1295	0.1286	-1.0071	0.3141
DEBT	-2.5584	0.5323	-4.8067	0.0000
R^2	0.2875			
Observations	82			
Cross-sections	19			
Total pool obs.	1539			

Industrials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	2.4695	0.2734	9.0341	0.0000
VAIC	0.1592	0.0351	4.5392	0.0000
FSIZE	-0.1806	0.0411	-4.3962	0.0000
DEBT	-1.8523	0.1877	-9.8674	0.0000
R^2	0.4072			
Observations	234			
Cross-sections	53			
Total pool obs.	12296			

Consumer staples	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	5.2126	4.0477	1.2878	0.2007
VAIC	0.4654	0.2839	1.6395	0.1042
FSIZE	-0.3297	0.5114	-0.6447	0.5206
DEBT	-8.6542	1.4376	-6.0198	0.0000
R^2	0.6486			
Observations	22			
Cross-sections	5			
Total pool obs.	110			

Information tech.	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.5008	0.2719	1.8418	0.0656
VAIC	0.1530	0.0351	4.3564	0.0000
FSIZE	0.0345	0.0353	0.9773	0.3285
DEBT	-0.3088	0.2999	-1.0296	0.3033
R^2	0.3353			
Observations	126			
Cross-sections	34			
Total pool obs.	4284			

Energy	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	-0.8190	0.5435	-1.5069	0.1357
VAIC	-0.0028	0.0080	-0.3436	0.7321
FSIZE	0.1708	0.0808	2.1139	0.0376
DEBT	-0.0142	0.2502	-0.0567	0.9550
R^2	0.2411			
Observations	15			
Cross-sections	6			
Total pool obs.	90			

Materials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	2.9285	0.4935	5.9337	0.0000
VAIC	0.1784	0.0618	2.8884	0.0040
FSIZE	-0.3492	0.0931	-3.7501	0.0002
DEBT	-0.5211	0.2160	-2.4127	0.0160
R^2	0.3040			
Observations	75			
Cross-sections	12			
Total pool obs.	900			

Financials	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	2.5049	0.3433	7.2958	0.0000
VAIC	-0.0060	0.0071	-0.8400	0.4009
FSIZE	-0.2627	0.0397	-6.6174	0.0000
DEBT	-0.7866	0.1582	-4.9709	0.0000
R^2	0.3277			
Observations	163			
Cross-sections	31			
Total pool obs.	4836			

Telecom. services	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	3.0776	0.5826	5.2823	0.0000
VAIC	0.1018	0.0238	4.2863	0.0000
FSIZE	-0.3550	0.0805	-4.4112	0.0000
DEBT	-0.4106	0.3364	-1.2206	0.2230
R^2	0.4705			
Observations	35			
Cross-sections	12			
Total pool obs.	420			

Health care	Coefficient	Std. Err.	t-Stat.	P-value
Intercept	0.9055	0.4134	2.1906	0.0287
VAIC	0.1065	0.0282	3.7712	0.0002
FSIZE	-0.0573	0.0616	-0.9310	0.3521
DEBT	-0.1983	0.1839	-1.0779	0.2813
R^2	0.3733			
Observations	71			
Cross-sections	14			
Total pool obs.	994			

Exhibit 6 - Classification for prediction models

Company	Industry	VAIC	MB	Pr. MB	Class	ROA	Pr. ROA	Class	ATO	Pr. ATO	Class
Betsson	Consumer Discr.	5.411	4.528	4.460	1	0.224	0.061	0	0.766	1.407	0
Björn Borg	Consumer Discr.	5.525	8.398	4.480	0	0.279	0.063	0	0.972	1.406	0
Clas Ohlson	Consumer Discr.	3.211	6.587	4.589	0	0.275	0.065	0	2.122	1.315	0
Electrolux	Consumer Discr.	3.252	1.841	4.002	0	0.072	0.091	0	1.620	1.018	0
Eniro	Consumer Discr.	3.549	2.309	0.981	0	0.095	0.025	0	0.351	0.491	0
Gant	Consumer Discr.	15.765	13.514	4.158	0	0.206	0.217	1	1.025	1.063	1
Hemtex	Consumer Discr.	3.425	7.899	3.754	0	0.260	0.034	0	1.853	1.239	0
H & M	Consumer Discr.	4.291	9.080	5.874	0	0.450	0.192	0	1.918	1.104	0
KappAhl	Consumer Discr.	4.276	5.462	1.404	0	0.215	0.022	0	1.583	0.664	0
Lindex	Consumer Discr.	0.752	13.063	3.389	0	-0.433	0.009	0	1.811	1.121	0
MTG	Consumer Discr.	3.374	1.157	4.205	0	0.139	0.053	0	1.038	1.269	0
New Wave Group	Consumer Discr.	2.790	2.132	0.832	0	0.079	-0.019	0	0.897	0.627	0
Nobia	Consumer Discr.	3.058	2.376	3.413	0	0.126	0.050	0	1.659	1.040	0
RNB Retail & Brands	Consumer Discr.	2.580	2.663	2.680	1	0.087	0.010	0	1.163	1.004	0
Unibet	Consumer Discr.	4.142	5.156	1.293	0	0.106	-0.045	0	0.386	0.958	0
AarhusKarlshamn	Consumer St.	3.219	1.985	1.161	0	0.077	0.004	0	1.488	0.630	0
Axfood	Consumer St.	3.822	6.351	4.205	0	0.137	0.080	0	4.437	1.160	0
Oriflame	Consumer St.	6.178	26.278	1.405	0	0.310	0.029	0	2.214	0.725	0
Lundin Petroleum	Energy	12.443	2.193	5.086	0	0.095	0.221	0	0.265	1.142	0
PA Resources	Energy	19.893	2.225	4.187	0	0.263	0.283	0	0.410	0.951	0
West Siberian Res.	Energy	6.433	1.212	4.545	0	0.027	0.092	0	0.346	1.326	0
Bure Equity	Financials	1.949	1.287	3.634	0	0.043	0.009	0	0.725	1.252	0
Castellum	Financials	8.531	0.984	2.425	0	0.033	0.116	0	0.081	0.704	0
Carnegie	Financials	2.787	3.272	2.724	0	0.019	0.037	0	0.126	0.892	0
Fabege	Financials	7.447	0.991	1.731	0	0.020	0.093	0	0.066	0.564	0
Hakon Invest	Financials	0.490	1.065	4.270	0	-0.009	0.027	0	0.105	1.272	0
Hufvudstaden	Financials	12.239	1.040	4.723	0	0.034	0.199	0	0.062	1.140	0
Industrivärden	Financials	-30.928	0.555	-0.083	0	-0.032	-0.429	0	0.034	0.709	0
Investor	Financials	3.382	0.418	4.584	0	0.004	0.122	0	0.016	1.038	0

JM	Financials	4.019	3.025	4.607	0	0.214	0.083	0	1.285	1.267	1
Kaupthing Bank	Financials	3.655	1.879	2.239	0	0.013	0.160	0	0.070	0.186	0
Kinnevik	Financials	2.928	0.625	4.068	0	0.011	0.089	0	0.122	1.030	0
Kungsleden	Financials	11.116	1.087	1.477	0	0.039	0.136	0	0.098	0.460	0
Lundbergföretagen	Financials	3.389	0.528	3.668	0	0.042	0.068	0	0.302	1.044	0
Nordea Bank AB	Financials	3.636	1.737	4.053	0	0.010	0.159	0	0.043	0.711	0
OMX AB	Financials	3.193	6.196	3.997	0	0.101	0.092	1	0.317	1.008	0
Ratos AB	Financials	2.083	1.717	2.439	0	0.032	0.045	0	0.594	0.738	0
Rezidor Hotel	Financials	3.220	3.051	3.931	0	0.140	0.044	0	1.972	1.227	0
SEB	Financials	3.131	1.426	2.775	0	0.007	0.110	0	0.052	0.563	0
Swedbank	Financials	3.607	1.387	1.967	0	0.009	0.102	0	0.057	0.393	0
Handelsbanken	Financials	3.958	1.700	1.981	0	0.008	0.115	0	0.050	0.349	0
Wallenstam	Financials	3.320	0.787	1.459	0	0.009	0.018	1	0.064	0.653	0
Wihlborgs Fast.	Financials	8.849	0.995	1.412	0	0.032	0.082	0	0.076	0.599	0
AstraZeneca	Health Care	4.011	4.233	3.055	0	0.176	0.091	0	0.623	0.782	0
Elekta	Health Care	2.814	5.734	3.429	0	0.089	0.049	0	0.847	1.038	0
Getinge	Health Care	3.254	4.953	2.413	0	0.112	0.074	0	0.736	0.646	0
Karo Bio	Health Care	-0.163	1.325	3.234	0	-0.477	-0.078	0	0.017	1.464	0
Meda	Health Care	3.616	2.213	1.832	0	0.059	0.059	1	0.289	0.572	0
Q-Med	Health Care	2.245	6.075	4.178	0	0.090	0.044	0	0.764	1.250	0
Alfa Laval	Industrials	3.750	5.014	4.160	0	0.195	0.108	0	1.117	1.005	0
Assa Abloy	Industrials	3.053	2.909	2.821	1	0.146	0.085	0	0.910	0.697	0
Atlas Copco	Industrials	4.397	5.553	2.888	0	0.215	0.120	0	1.135	0.607	0
Broström	Industrials	3.779	1.201	0.698	0	0.060	-0.007	0	0.412	0.582	0
Cardo	Industrials	2.893	2.036	3.095	0	0.127	0.030	0	1.506	1.040	0
Haldex	Industrials	2.878	1.340	2.277	0	0.059	-0.005	0	1.598	0.978	0
Hexagon	Industrials	2.783	3.435	2.407	0	0.087	0.068	0	0.597	0.646	0
Husqvarna	Industrials	3.866	2.974	2.003	0	0.127	0.066	0	1.193	0.598	0
Intrum Justitia	Industrials	3.222	4.937	2.506	0	0.126	0.039	0	0.608	0.844	0
Lindab Int.	Industrials	3.382	3.904	2.543	0	0.178	0.048	0	1.261	0.816	0
Munters	Industrials	3.824	4.748	2.508	0	0.150	0.034	0	1.648	0.899	0
NCC	Industrials	3.538	1.173	3.990	0	0.082	0.060	0	1.728	1.183	0
NIBE Industrier	Industrials	3.031	4.070	1.661	0	0.099	0.015	0	1.202	0.708	0
Peab	Industrials	3.478	2.767	4.215	0	0.088	0.066	0	2.101	1.212	0
SAAB	Industrials	2.705	1.199	3.921	0	0.061	0.060	1	0.692	1.121	0
Sandvik	Industrials	3.548	4.612	3.352	0	0.167	0.128	0	1.026	0.659	0
SAS	Industrials	2.440	0.797	3.486	0	0.026	0.052	0	1.087	1.023	0
Scania	Industrials	3.968	2.483	2.857	0	0.131	0.107	0	0.974	0.645	0
Securitas	Industrials	7.214	3.553	2.783	0	0.072	0.131	0	1.675	0.664	0
Securitas Direct	Industrials	3.197	5.331	4.320	0	0.102	0.061	0	1.418	1.254	0
Skanska	Industrials	2.683	2.356	4.797	0	0.034	0.107	0	1.780	1.139	0
SKF	Industrials	3.335	2.530	4.045	0	0.168	0.104	0	1.291	0.969	0
Trelleborg	Industrials	2.737	1.103	2.222	0	0.068	0.034	0	1.081	0.763	0
Volvo	Industrials	3.120	2.674	3.453	0	0.067	0.138	0	0.912	0.619	0
Axis	Info. Tech.	3.916	20.001	4.700	0	0.395	0.081	0	1.828	1.299	0
Ericsson	Info. Tech.	2.627	1.800	4.878	0	0.092	0.152	0	0.804	0.936	0
Net Insight	Info. Tech.	2.891	8.830	3.976	0	0.079	0.004	0	0.877	1.421	0
Nokia	Info. Tech.	3.760	6.904	5.271	0	0.192	0.148	0	1.416	1.123	0
Orc Software	Info. Tech.	2.533	7.380	4.079	0	0.103	0.013	0	0.776	1.391	0
Telelogic	Info. Tech.	2.548	2.868	3.314	0	0.128	0.021	0	0.683	1.132	0
TietoEnator	Info. Tech.	4.116	2.324	2.700	0	0.145	-0.005	0	1.457	1.164	0
TradeDoubler	Info. Tech.	3.615	10.937	1.571	0	0.089	0.009	0	1.218	0.742	0
BE Group	Materials	4.030	3.393	2.407	0	0.180	0.017	0	2.688	0.966	0
Billerud	Materials	3.081	1.182	2.083	0	0.063	0.004	0	0.843	0.887	1
Boliden	Materials	4.760	1.718	3.696	0	0.195	0.100	0	1.219	0.961	0
Holmen	Materials	2.929	0.881	3.558	0	0.047	0.062	0	0.582	1.018	0
Höganäs	Materials	3.137	1.673	2.993	0	0.109	0.025	0	1.133	1.049	0
SSAB	Materials	3.875	1.465	2.019	0	0.099	0.084	0	0.531	0.510	1
Stora Enso	Materials	2.847	0.837	2.581	0	0.058	0.024	0	0.877	0.920	1
SCA	Materials	2.454	1.061	3.340	0	0.040	0.094	0	0.735	0.769	1
Tele2	Telecom. serv.	4.440	1.963	3.949	0	0.057	0.122	0	0.957	0.905	0
TeliaSonera	Telecom. serv.	4.331	2.317	4.516	0	0.095	0.174	0	0.471	0.807	0