

ACTA

UNIVERSITATIS OULUENSIS

*Pasi Karjalainen*

VALUATION OF INTANGIBLE  
ASSETS IN DIFFERENT  
FINANCIAL ENVIRONMENTS

FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION,  
DEPARTMENT OF ACCOUNTING AND FINANCE,  
UNIVERSITY OF OULU

G

OECONOMICA





*PASI KARJALAINEN*

**VALUATION OF INTANGIBLE  
ASSETS IN DIFFERENT FINANCIAL  
ENVIRONMENTS**

Academic dissertation to be presented, with the assent of  
the Faculty of Economics and Business Administration of  
the University of Oulu, for public defence in Auditorium  
TA105, Linnanmaa, on May 25th, 2007, at 12 noon

Copyright © 2007  
Acta Univ. Oul. G 29, 2007

Supervised by  
Professor Juha-Pekka Kallunki

Reviewed by  
Professor Wolfgang Bessler  
Professor Tomi Laamanen

ISBN 978-951-42-8439-7 (Paperback)  
ISBN 978-951-42-8440-3 (PDF)  
<http://herkules oulu.fi/isbn9789514284403/>  
ISSN 1455-2647 (Printed)  
ISSN 1796-2269 (Online)  
<http://herkules oulu.fi/issn14552647/>

Cover design  
Raimo Ahonen

OULU UNIVERSITY PRESS  
OULU 2007

## **Karjalainen, Pasi, Valuation of intangible assets in different financial environments**

Faculty of Economics and Business Administration, Department of Accounting and Finance,  
University of Oulu, P.O.Box 4600, FI-90014 University of Oulu, Finland

*Acta Univ. Oul. G 29, 2007*

Oulu, Finland

### ***Abstract***

The purpose of this dissertation is to investigate the valuation of intangible assets in different financial environments. Value relevance of intangible investments has been largely recognized by indicating their close relatedness on future operating performance and valuation of firms. The financial environment of the country (market- or bank-based) is also found to be an important determinant of the economic performance of the firm. This thesis combines these two important issues by examining how a country's financial system affect the firm's investments and valuation of intangible assets.

The study consists of four essays and an introductory section. Essay I investigates the firm's investments in human capital in different legal- and financial environments. The results of this study indicate that human capital asset constitutes an essential part of the market value of firms in all our sample countries. The results also suggest that firms make investments in human capital to increase their innovation capabilities and to improve their future benefits.

Essay II investigates the firm's investments in R&D capital in different financial systems. The common result concerning both financial system is that the estimated R&D capital constitutes a great part of the firm's unrecorded goodwill. The main finding of the study is that the effects of the firm's past profitability and growth on its estimated R&D capital are stronger in bank-based than market-based financial systems. This result emphasizes the role of bank-based financing over market-based financing in the efficiency of resource allocation to R&D investments.

Essay III investigates the stock market's response to the firm's R&D investments in different financial systems by taking account of lead-lag structure between the firm's R&D investments and its market value. The main result of the study is that the stock markets' response to current R&D investments varies between different financial systems with regards to the point in time against which the stock market response is examined. This study suggests that information disclosure policies, level of stock-market expectations and attitude towards risk are the most important potential factors that explain the valuation differences of R&D between market- and bank-based financial systems.

Essay IV investigates the effect's of a country's financial system on current R&D investments and the future profitability of the firm. The main results of this study can be summarized as follows: the firm's current R&D investments are more strongly associated with the level of future firm profitability in bank-based than market-based financial system whereas current R&D investments are more strongly associated with the uncertainty of future firm profitability in market-based than bank-based financial system. The findings of this study suggest that differences in the valuation of R&D between market-based and bank-based financial systems mainly depends on the information asymmetry between the firm and its investors.

***Keywords:*** financial system, human capital, R&D investments



## Acknowledgements

This dissertation has been a challenging project which has demanded the guidance and support of several people. I would like to express my greatest gratitude to my supervisor, Professor Juha-Pekka Kallunki. He has been an excellent and encouraging supervisor with his forwarding comments and suggestions. His large expertise in this area has provided me with such confidence that has continued from the beginning of the studies to the end of this final stage. He has put a lot of effort and time into supervising my thesis. I would like to express my deepest appreciation for this.

I would like to express my warmest thanks to Professor Markku Rahiala, who has provided a great support in statistical issues during my work. He has always had time to sincerely help with complex statistical analyses, and his expertise in this area has strengthen my confidence with econometrical issues of this work.

I am very grateful to the official pre-examiners, Professor Tomi Laamanen and Professor Wolfgang Bessler. Their valuable comments and suggestions guided me to improve the quality of the thesis and see many issues from different and broader viewpoints.

I would like to thank many colleagues in the Faculty of Economics and Business Administration at the University of Oulu. I am grateful for Dr. Jaakko Simonen (current in Research and Innovation Services), Dr. Hanna Silvola and M.Sc. Petri Kyröläinen for all friendship and support during the research process. Special thanks also belongs to M.Sc. Jukka Pakola for his many understandable recommendations in econometrical issues. I would like to give my common express all those colleagues who have furthered this thesis with many insightful comments and suggestions. I would like to express my sincere thanks to M.Sc. Marjukka Manninen, Raimo Kalliopuska and M.Sc. Jukka Ruopsa for many broad-minded discussions, usually out of professional issues. I would like to warmly thank all administrative staff who has provided a splendid setting for conducting this research. I am also grateful for all sports-minded colleagues for providing opportunity to going in for different sport activities during this long journey. Without this support, the process would have been much difficult to carry out.

For English editing I am very grateful for B.A. Samantha Eidenbach, M.A. Virginia Mattila and B.A. and M.A. Angeliqe Johnston. I wish to express my thanks to Dr. Seppo

Eriksson for the editorial advice and Ville Varjonen for the technical support in editing of the thesis.

The completion of this thesis has also demanded the support of many outside financiers. The earliest stage of the financing was based on the project sponsored by the OKO Bank Research Foundation. Since that this thesis has been a part of the project funded by Academy of Finland, Liike2 program. The following foundations supported this work by research grants: Jenny and Antti Wihuri Foundation, Oulu University Scholarship Foundation, Tauno Tönning Foundation, the Foundation for Economic Education, the Finnish Foundation for the Advancement of Securities Markets, Warcus Wallenbergin Liiketaloudellinen Tutkimussäätiö, Kaupallisten –ja Teknisten Tieteiden Tukisäätiö, Pohjois-Pohjanmaan Kulttuurirahasto, Säästöpankkien Tutkimussäätiö, and Paulon Säätiö. I gratefully acknowledge the Academy of Finland, OKO Bank Research Foundation and all these foundations.

Finally, the last and most heartfelt thanks goes to my family. I would like to thank my parents Arja and Tuomo who have always encouraged me to continue my studies and provided lot of support during this long trip. I would like to express my warmest appreciation for this. I am also grateful for my sisters who have always shown interest towards my studies and provided different kind of support during this process. The deepest gratitude I owe is to my loving wife Päivi and our sweet daughter Pihla. Everyday life with you and your love have provided irreplaceable strength and faith to finish this long journey of research. I devote a great expression of love for this.

Oulu, April 2007

Pasi Karjalainen



## **List of Original Articles**

The thesis includes the following separate essays.

- I Kallunki, J-P, Karjalainen P & Martikainen M (2005) Investments in Human Capital in Different Institutional Environments. *Advances in International Accounting* 18:121-140.
- II Karjalainen P (2007) Economic Relevance and Determinants of R&D Capital in Different Financial Systems. *International Journal of Accounting, Auditing and Performance Evaluation* 4:1-30.
- III Karjalainen P (2006) Lead-Lag Structure between the R&D Investments and Market Values in Different Financial Environments. Manuscript.
- IV Karjalainen P (2007) R&D Investments: The Effects of Different Financial Environments on Firm Profitability. *Journal of Multinational Financial Management* (accepted for publication)



## Contents

Abstract	
Acknowledgements	
List of Original Articles	
Contents	
1 Introduction .....	11
2 Stock market valuation of intangibles .....	15
3 Different financial systems and valuation of intangibles.....	19
4 Summary of the articles.....	22
4.1 Investments in human capital in different institutional environments (essay I) .....	22
4.2 Economic relevance and determinants of R&D capital in different financial systems (essay II) .....	23
4.3 Lead-lag structure between the R&D investments and market values in different financial environments (essay III) .....	24
4.4 R&D investments: The effects of different financial environments on firm profitability (essay IV) .....	25
References	
Original Articles	



# 1 Introduction

Investments in intangible assets such as human resources, research and development and advertising are important to strengthen the firm's competitive advantage by producing higher levels of knowledge and technological innovation. Investments in innovation are intended to increase the future earnings of the firm, wealth of the shareholders and finally the overall economic growth. The understanding and recognition of value relevance of intangibles has awoken the increasing attention of the firms' stakeholders including investors, creditors, managers, policy makers and researchers.

The positive association between the investments in intangibles and future profitability of the firms is demonstrated by e.g. Lev & Sougiannis (1996) and Eberhardt *et al.* (2004) among others. There is also a growing body of literature investigating how expected future benefits related to the intangible investments of the firm are valued on the stock market. Common findings of these value relevance studies are that investments in intangibles are valued by the stock market, i.e. they are treated as an investment rather than a cost by investors.

In order to promote the investments in innovation, the accessibility of required financing is essential to carry out the feasible investment projects. Different country-specific factors such as development of a country's legal and financial systems are found to affect efficient capital allocation and economic growth (e.g. La Porta *et al.* (1997, 1998), Beck & Levine (2000), Levine (2000)). Depending on the financial environment of the country, the degree and amount of information disclosure influence the value recognition of intangible investments. The role of information disclosure is important for the investors and other interest groups of the firm, because they all demand relevant, reliable and timely information of the future benefits associated with intangible investment. Because the value of intangible investments is not typically disclosed in the firms' financial accounts, the information disclosure policies between the firm and its stockholders thus play a dominant role in the valuation of intangible assets.

The purpose of this thesis is to investigate the value relevance of intangibles in different financial environments. Past empirical studies have largely indicated the value relevance of intangibles by demonstrating their close relatedness on future operating performance and market value of the firms. Moreover the significance of different financial systems on the efficient capital allocation and economic performance has been

widely examined. This thesis merges these two important research issues to contribute to the current literature of both remarkable research areas by focusing on two main aspects of the past empirical literature.

First we examine how the country's financial system affects firms' investment in intangible assets. By providing a special case of the intangible investments in different financial systems, it contributes to the studies investigating efficient capital allocation in economy. The purpose of the first two essays is to investigate and compare the firm's investments in estimated human and R&D capital in different financial environments. These studies use two alternative procedures to estimate the amount of human and R&D capital of the firm from their labour and R&D expenditures. These essays increase our knowledge which of these systems may offer better conditions to carry out investments in intangibles and thus improve the technological innovations and performance of the firms. The economic relevance of these estimated intangible assets are examined by associating the estimated human and R&D capital with some important firm-specific determinants. This increases our knowledge of how these firm-specific characteristics affect the structure of intangible assets and are these effects similar in both financial environments.

Secondly, we examine how the country's financial system affects the stock market valuation of intangible investments. The main contribution of this section is to answer the question of how investments in intangibles are valued in different financial systems in which the disclosure policies of value relevant financial information between the firms and its investors are not identical.

The third essay investigates the stock market's response to R&D investments in different financial systems by taking account of lead-lag structure between the firm's R&D investments and its market values. The purpose of this essay is to investigate how different financial systems, with a distinctive degree of information disclosures between the firms and its investors, affect the stock market's response to R&D investments. This essay describes how investors are informed of future benefits associated with intangible investments in different financial environments and how this availability of information is reflected in the market values of the firms. In other words this paper analyzes which of these alternative financing systems work better in the sense that how they enhance the efficient use and valuation of the relevant information on intangible investments.

The fourth essay investigates how R&D investments affect the level and uncertainty of future profitability of the firm in different financial environments. The purpose of this essay is to investigate whether the R&D investments and their relation towards future firm profitability can explain the valuation differences of R&D spending between market-based and bank-based financial systems. More accurately, we examine whether these valuation differences are due to the link between the R&D investments and future firm profitability or the information asymmetry between the firm and its investors. Because many stakeholders of the firm require a reliable valuation of the firm's intangible investments, this essay increases our knowledge by determining the factors behind this valuation process. As it is a major task of the financial system to promote and monitor the strategic investments of the firms, this essay increases our knowledge how the financial system of a country affect to the profitability of the intangible investments. Moreover, this essay provides information on how much risk the intangible investments involve i.e. how uncertain the future benefits of intangible investments are in different

financial systems and whether this can be a potential factor behind the valuation differences of intangibles.

This thesis provides implications to the main three areas of financial accounting theory including capital allocation, information asymmetry and risk. As suggested by earlier literature, these three issues are found to be characteristics that may vary in different financial environments. Their significance as potential determinants on the valuation of intangibles has been examined in this thesis. At first, the results of our thesis suggest that financial system of the country may affect how efficiently resources are allocated to the firms' intangible investments. Our results indicate that resource allocation to the intangibles is efficient in both market-based and bank-based financial systems. The investments in intangible assets make economic sense in both types of financial systems because some important firm-specific determinants significantly explain the firms' investments in intangible assets. However, our findings suggest that strength of the resource allocation efficiency may vary between different financial systems. This explanation is supported by the results that some firm-specific determinants like past profitability and growth of the firm are more closely related to firms' R&D capital in bank-based than market-based financial system. Moreover, we find that current R&D investments are stronger related to the future firm profitability in bank-based than market-based financial system. These results imply that capital allocation on intangibles may be more effective in a bank-based financial system and thus can act as a potential explanation for reported differences in the results.

Secondly, this thesis provides implications to the theory which assesses the importance of intangible investments on the valuation of the firms. It introduces the asymmetrical information as an explanation to the valuation differences in different stock markets. Our empirical findings imply that the valuation effects, i.e. how efficiently the information of the firms' R&D investments is reflected in their market values, depend on the country's financial system. These valuation differences may exist because the amount and timeliness of value relevant information that is available between the firm and its investors is conditional for which financial system dominates. The current theory suggest that more information is available between the firm and its investors in market-based than in bank-based financial system. Our results support the prevailing theory indicating that R&D investments of the firm are more efficiently valued in a market-based than in a bank-based financial system. Moreover, our findings concerning the future profitability of the firms' current R&D investments confirm our proposition that information asymmetry rather than the fundamental association between the current R&D investments and future firm profitability can be a potential explanation for the valuation differences of R&D between different financial systems.

Thirdly, our empirical results have implications to the theory which introduces the risk as a potential explanatory factor for the differences in the financial performance and valuation of the firm's intangible assets in different financial environments. In bank-based financial systems, the firms' investments in R&D may involve less risk because they can be on more conservative level, more properly justified and more related to long-term expectations of future benefits. In market-based financial system, the short-term stock price expectations of the equity investors may encourage firms to take higher risks in their R&D investments. Our empirical findings suggest that the risk-averse nature of bank-based financing may explain the stronger relationship between the firm's R&D and

the level of future firm profitability in bank-based than in market-based financial systems. Similarly, this same issue may explain more stable valuation effects in bank-based than in market-based financial systems. In accordance with possible risk explanation, our results indicate that R&D effects on the uncertainty of the firm's future profitability are stronger in market-based than bank-based financial system. Moreover, we find stronger and more volatile valuation effects of R&D in market-based than bank-based financial systems.



## 2 Stock market valuation of intangibles

According to the traditional financial accounting theory, the information is value-relevant if it changes the investors' expectations of the firm's value. Early capital market research such as Ball & Brown (1968) and Beaver (1968) demonstrate that financial statement numbers provide information that is reflected in the security prices. When applying the research conducted by Kothari & Zimmerman (1995), the relationship between the financial accounting information and stock prices is based on the standard valuation model in which the price is the discounted present value of the expected net cash flows.

Similar theoretical patterns can also be applied in the valuation of intangibles in which the role of non-financial information in addition to traditional financial information is becoming more relevant. Amir and Lev (1996), Demers & Lev (2001) and Junttila *et al.* (2005) argue that investments in intangibles produce earnings figures that are not anymore good indicators of the future performance of the firms. Instead of that they suggest that non-financial information is highly value-relevant. As suggested by Lev & Zarowin (1999), Chang (1998), Collins *et al.* (1997) and Francis & Schipper (1996), the increased intensity of intangible investments has decreased the usefulness of traditional financial statement information to investors. They find that the relationship between earnings and stock prices has declined during time. Because intangible investments are usually expensed as they are incurred, both earnings and book value of equity will be understated. This impedes investors to establish unbiased estimates of the firm value because future benefits are highly due to these unrecognized intangible investments. The limited capability to recognize the value of intangibles may also lead to inefficient resource allocation in the capital markets. Investors may prefer firms with a low level of intangibles and a higher level of earnings and book values because these firms look attractive in the short-term, whereas the future earnings in the long-term are likely to regress. On the contrary they avoid the firms with high level of intangible investments because their earnings figures are less attractive in the short-term but whose future earnings are likely the increase in the long-term.

The increased intensity of intangible investments brings forth the question of how the disclosed accounting information is reflected in the market values of the firms. Financial accounting research e.g. Beaver *et al.* (1980), Collins and Kothari (1989), Easton *et al.* (1992), Kothari (1992), Kothari & Sloan (1992), Collins *et al.* (1994), and recently Ball

*et al.* (2000) largely agree that prices lead earnings i.e. some value relevant information is reflected in security prices prior to the publication of accounting earnings. Kothari & Sloan (1992) suggest that prices will lead earnings information because historical cost accounting is not able to reflect expectations of future cash flows on a timely basis. These findings have straight implications to the valuation of intangibles because their value is largely based on expectations of future cash flows which are not yet observable in current earnings and book values. As pointed out by Lev & Zarowin (1999), to properly evaluate intangibles, investors need more comprehensive, more reliable and timelier information on intangibles and their impact on firm's future profitability.

The value-relevance of intangibles has been extensively documented in the literature. Research interests are mainly focused on the valuation of R&D investments which are seen as major driver of innovation and creation of competitive advantage of the firms. Past empirical research in this area reveals that current investments in R&D are associated with higher future earnings and stock returns. Lev & Sougiannis (1996) report that current R&D expenditures are positively associated with subsequent earnings. Eberhart *et al.* (2004) find that firms which increase their R&D expenditures report significantly positive operating performance in the future. Bublitz & Ettredge (1989) examine the length of time over which R&D benefits will accrue. They investigate the lag relation between the R&D inputs and outputs such as patents and profitability and find that duration of R&D benefits takes several years.

Chambers *et al.* (2002) examine the long-term relationship between the R&D investments and stock returns and find that the unrecorded R&D asset to market value of equity and post-investment excess returns are positively associated. In addition, they report that R&D intensive firms earn excess returns that persist for up to ten years. Similar results are also reported by Lev & Sougiannis (1996). Chan *et al.* (2001) use a portfolio approach to investigate whether the stock market correctly recognizes the expected future benefits of R&D spending. They allocate firms into portfolios based on the ratios of R&D expenditures to sales and market value of equity. Then they calculate annual buy and hold returns over the three years following portfolio formation. They find no significant positive relation between the R&D expenditures relative to sales and subsequent excess returns. This indicates that market, on average, correctly values any future benefits from R&D spending. However, instead they find that R&D expenditures relative to market value of equity and future excess returns are significantly and positively related. This suggests that the stock market does not immediately recognize the value of the R&D investments. Penman and Zhang (2002) find that firms whose ratios of unrecorded R&D asset to net operating assets have increased (decreased) in the current year earn positive (negative) excess returns in the following year.

According to the market efficiency hypothesis, stock prices should reflect the new information without any delay after it has been published in the market. Daniel & Titman (2001) and Eberhart *et al.* (2004) suggest that the market is slow in recognizing the future benefits associated with R&D investments. This, in fact, contradicts the basic implication of the efficient market hypothesis. An alternative explanation for the positive relationship between the R&D expenditures and future excess returns is provided by Chambers *et al.* (2002). They argue that reported excess returns related to R&D spending are more likely due to inadequate risk measurement rather than market mispricing. Firms' announcement to increase R&D spending are found to have positive share-price

responses, which indicate that the market is not myopic but expects current R&D investments to produce increased earnings flows in the future (see Woolridge (1988), Jose *et al.* (1986), Morck *et al.* (1988), Chan *et al.* (1990), Morck & Young (1991) and Doukas & Swizer (1992)). This finding is also found to be consistent even in the presence of declining earnings. The event study approach is commonly applied when investigating the market response to the public announcements of new value-relevant information like R&D. Chan *et al.* (1990) use this methodology and find that announced plans to increase R&D expenditures increase the stock price on the event day and the following day.

The discussion of whether resources spent on intangibles should be capitalized on or expensed in the financial statements has raised a lot of research attention in the financial accounting research field. The main motivation of this research arises from the important purpose to develop the relevancy of financial accounting information from the standpoint of the users of the financial statement information. According to the matching principle, which is largely applied in the accounting of tangible investments, the resources sacrificed to intangibles should be presented on the balance sheet, if they are associated with future benefits and cash flows (see Ballester *et al.* (2003)). As Hoegh-Krohn & Knivsfå (2000) suggest, capitalization and matching costs of intangibles with future benefits increase the informativeness of financial accounting information.

The significance of proper accounting treatment of intangibles has been established in many studies investigating the value-relevance of R&D spending. All of these studies suggest that capitalizing and amortizing R&D costs provide accounting measures that are more related with stock prices and returns compared to those measures which are based on the current requirement to expense R&D costs as they are incurred (see Loudder & Behn (1995), Lev & Sougiannis (1996), Monahan (1999), Chambers *et al.* (2000, 2002) and Healy *et al.* (2002)).

Past empirical literature provide different methods to determine the most relevant way to capitalize R&D expenses and thus estimate the value of R&D assets. Chan *et al.* (2001) and Chambers *et al.* (2002) use a straight-line method which is commonly applied in the accounting of tangibles. It assumes that R&D expenditures should be amortized with similar annual amounts depending on the number of years over which future benefits are expected to accrue. Sougiannis (1994), and Lev & Sougiannis (1996, 1999) estimate the R&D asset from subsequent operating income. They explain current earnings with past R&D in cross-sectional regressions and then use these cross-sectional estimates of the capitalization and amortization coefficients to calculate firm-specific R&D assets and amortization expenses. Ballester *et al.* (2003) estimate the firm-specific economic value of the R&D asset based on the time-series regression of market-to-book ratios on book values, earnings and R&D expenditures.

In contrast to supporting one-sided capitalization of intangibles, the expensing policy can be justified if future benefits associated with intangibles are expected to be highly uncertain. Kothari *et al.* (2002) and Amir *et al.* (2004) argue that R&D expenditures increase future earnings-variability significantly, more than capital expenditures. This indicates that future benefits from R&D expenditures are more uncertain than those from capital expenditures. Al-Horani *et al.* (2003) report parallel results showing that the association between the returns and R&D activity is significant even after controlling for the Fama & French (1993) risk factors like size and book-to-market. The expensing

policy of intangibles can be also recommended for the following reasons: they do not have alternative uses, they are not always separable, because they usually have value in combination with other firm's assets and their recoverability is subject to a great degree of uncertainty (see Canibano *et al.* (1999)).

### **3 Different financial systems and valuation of intangibles**

The increasing innovative activity in the global economy brings up the question of the effectiveness of financial markets and financial intermediaries to finance new industries and technologies in which the firms' success is largely based on the investments in intangibles. The key issue in this context is the relation between a country's financial system and its economic development. La Porta *et al.* (1997, 1998) argue that main basis of the effectiveness of a country's financial system depends on its legal system in which the different enforceable contracts between firms and investors are determined.

The country's financial system can have an important impact on the kind of investments firms implement and how efficiently they are carried out. As Demirküc-Kunt & Maksimovic (2002) states, the main purpose of the financial system, typically identified as market-based and bank-based financial system, is to promote the funding of the strategic investments, select the most valuable and promising projects to be funded and, finally monitor the progress of the funded investments. Allen & Gale (1995) provide a comparison between bank-based and market-based financial systems. In a country with bank-based financial system, the banking industry is relatively concentrated and there is a large number of banking offices. The competition between banks and financial markets is limited and investors have restricted access to a range of investments instruments. Banks are heavily involved in the control of industrial firms and create long-term relationships with those firms. Moreover, there is little publicly available information about the firms, and the role of corporate control is limited. On the contrary, circumstances are quite contrasting in a country with market-based financial system. One important feature of a market-based financial system is the availability of information which creates opportunities for an active market of corporate control. Well functioning corporate control improves successful acquisitions in situations where one company thinks that another company is undervalued or that it can better utilize the other company's resources.

A similar classification between market-based and bank-based financial systems is provided by Ali & Hwang (2000) and Yosha (1995) who compares the role of information disclosure between bilateral and multilateral financing forms. They suggest that in bank-based financial systems, banks have important role in the funding of the investments and thus, they are closely connected with the funded firms' business. This

united relationship allows banks to acquire information directly from the firms and thus, the demand for the publicly available information diminishes. In a market-based financial system, most of the financing of the investments is obtained directly from atomistic investors in the stock market. This increases the demand of the publicly available information because investors rely on the information disclosures to be used in security valuation.

As Allen & Gale (1995) further argue, the amount of information that is publicly available has implications for the allocation of investment i.e. how well the financed resources are used in the firms. The wide availability of information helps firms to make good investment decisions. The main reason behind these good investment decisions depends on the price system which conveys information for the efficient use of resources. Boot & Thakor (1997) suggest that in market-oriented financial systems, the firm get valuable information feedback from the market prices which then have positive impacts for their investment decisions and market prices. In bank-based financial systems, a similar feedback system of market information does not exist to the same extent. Instead the bank-based relationships can offer some substitute mechanisms. Close relationships between banks and firms may provide a large amount of information about the profitability of firms for the bank. The banks can then use this information to support and finance feasible investment projects.

Because of the separation of ownership and control, the monitoring managers i.e. how well the financed resources are used in the firms, is an important function both in market-based and bank-based financial environments. The problem of monitoring exists typically between the individual shareholders and managers because it is expensive for each individual shareholder to monitor the actions of the managers. Diamond (1984) suggests that this problem can be solved by using bank-based financing. By providing finance to a large number of firms, banks can reduce the risks and offer a fixed return to depositors. Because the fixed return is guaranteed to each depositor, they have no need to separately monitor the bank. Hence, each firm is monitored only once by the bank and the monitoring costs are thus minimized. (see more in Cable (1985) who provide some empirical evidence whether banks act as effective monitors in Germany).

Allen & Gale (1999) suggest that market-based financing may have some advantages in situations where new industries and their innovative projects are financed. Each investor is free to acquire relevant information and make his own decision to be involved in the financing of the project. In market-based financing, investors are informed and then decide whether to participate in the funding of the project. The nature of bank-based financing is not similar because decision to invest in a project is delegated to a manager. This may create opportunities in which funds can be allocated to a project even if some investors think the project is not a profitable one. On the other hand, the profitable project can be under-funded in bank-based financial environments. Despite the managers assurances that project is profitable, the diversity of opinion from investors in the market may prevent some important banks from giving funds to a project even if they have the same information as the managers. If the probability of disagreement is great enough, it may lead to the under-funding of the innovative projects.

Past empirical research has drawn remarkable attention to the examination of how the country's financial environment affects the efficient capital allocation, economic growth and the valuation of different accounting information. Beck & Levine (2000), Levine

(2000) and Demirküc-Kunt & Maksimovic (2002) report that overall financial development and the legal environment of the country are positively related to the industry growth, efficient capital allocation and the use of external financing. Beck *et al.* (2000) and King & Levine (1993 a,b) indicate that better functioning financial intermediaries improve resource allocation and promote productivity growth. Wurgler (2000) argue that the efficiency of capital allocation can be improved in circumstances where the stock market gathers more firm-specific information that is reflected in stock prices. Finally, Levine & Zervos (1998) report that even after controlling many factors associated with growth, stock market liquidity and banking development are positively related with contemporaneous and future economic growth, capital accumulation and productivity growth.

The existing literature also provides some discussion concerning the pros and cons of both market-based and bank-based financial systems. According to the literature review by Demirküc-Kunt & Levine (2004), banks can more effectively provide resources and commit to financing new innovative activities as the required financing is demanded during the progress of the project. Weinstein & Yafeh (1998) and Morck & Nakamura (1999) emphasize the role of market-based financing over bank-based financing, because banks are mainly expected to finance only conservative investments. In addition, La Porta *et al.* (2002) suggest that banks are more likely to finance labour-intensive industries rather than truly strategic industries.

Since the previous literature could not unambiguously indicate whether economic activity and the economic performance of the firm directly depends on the financial system of a country, it provides plenty of room for further research in the area. The classification of market-based and bank-based financial systems can provide an interesting basis for analyzing the value relevance of different accounting information, especially intangible information in these alternative financial environments. As earlier described in this section, the value recognition of different accounting information may depend on the level of information disclosures that is available in market-based and bank-based financial systems. Douthett Jr. *et al.* (2003) provide evidence which describes how the level of disclosure may affect the valuation of accounting information. They conclude that higher level of disclosure reduces investors' informational uncertainty which lead to lower discount rates and higher earnings response coefficients. Ali & Hwang (2000) find that the value relevance of financial accounting information is lower in bank-based than market-based financial system. Booth *et al.* (2006) compare the valuation of R&D between market-based and bank-based financial systems and find that the higher the portion of equity financing of the country relative to bank financing, the stronger the market response is to the R&D investments. Both of these studies support the explanation that higher amount of published value-relevant information in market-based financial systems make investors more certain about future benefits of R&D expenditures in market-based rather than in bank-based financial systems. This difference in the degree of informational asymmetry between the firm and its investors may explain different market responses to accounting information between these two financial environments.

## **4 Summary of the articles**

### **4.1 Investments in human capital in different institutional environments (essay I)**

The first essay investigates the proportion of labour costs that represents investments in human capital, and the rate of amortization of this asset in different institutional environments. The sample includes countries with different financial and legal systems, which enables us to examine how the growth and depreciation rates of human capital and the resulting human capital asset ratio differ in different institutional environments. The economic relevance of the estimated human capital asset is then tested by examining its firm-specific determinants.

Requirements for financial reporting are set by the country's legal and financial environment which cause the firms to either voluntarily or obligatorily report labour costs in their published financial statements. In the so-called common-law countries with a market-based financial system, financial reporting is aimed at providing information needed by equity investors. In code-law countries with a bank-based financial system the other stakeholders' needs are more important. Therefore, it can be assumed that the firms need for disclosing labour-related information is greater in countries with a market-based financial system than in countries with a bank-based financial system. In countries with market-based financial system, the growth/depreciation rates of human capital can be assumed to be high/low, because investors have broad information that is available for their decision making.

This paper contributes to the literature that investigates the market valuation of intangible assets, in particular the paper by Ballester *et al.* (1998). While Ballester *et al.* (1998) investigate the market valuation of firms' labour expenditures in the U.S. where some firms voluntarily disclose these costs in their financial reports; this paper investigates the degree and determinants of human capital in different countries with different financial reporting environment.

The results of the first essay indicate that the human capital asset constitutes an essential part of the market value of firms in all countries. The estimated proportion of human capital assets are on average more than 20% of the market value of equity in all



countries. The estimated proportion of labour expenses that represents investments in human capital is large in the so-called common-law countries with a market-based financial system.

The regression results indicate that the estimated human capital asset makes economic sense because it is reasonably related to the firm-specific characteristics that can be assumed to be the determinants of the human capital asset. The positive relation between the average salary and the ratio of human capital asset to the market value of equity indicates that firms that employ quality skill labour are likely to invest more in training and developing their human capital. The positive relation between the ratio of labour intensiveness and the ratio of human capital asset to the market value indicates that the labour-intensive firms invest intensively in retention and training of personnel. The negative relation between the firm profitability and ratio of human capital asset to the market value reveals that the profitable firms do not necessarily need to invest heavily in human capital. The statistically significant relationship between the size and the ratio of the human capital asset to the market value is reported in a case where all independent variables are included in the same model. The negative association indicates that larger firms do not need to have employees carry out more than a limited amount of tasks. Finally, the signs of the operating uncertainty and growth are as expected but remain insignificant. In a country-specific regression analysis, the relation between the estimated human capital assets and its firm-specific determinants is observed to be strongest in the U.K. and the U.S., which both can be regarded as countries with market-based financial systems. In countries with a bank-based financial system like Germany, France and Finland, the relation between the estimated human capital assets and its economic determinants is somewhat lower.

## **4.2 Economic relevance and determinants of R&D capital in different financial systems (essay II)**

The second essay investigates the firm's investments in research and development (R&D) capital in different financial systems. Value-relevance of R&D investments has been widely reported in past empirical studies. The firm's investments in R&D may, however, depend on the financial system of the country. Further prior literature suggest that a country's financial system affect the efficient capital allocation and the amount and degree of information disclosures. This study examines both country-specific and firm-specific factors in the creation of the firm's R&D capital.

The purpose of this essay is to investigate how different financial systems, with their distinctive disclosure policies of value-relevant financial information and ability to finance R&D investments, affect the firm's investments in estimated R&D capital. More precisely, we investigate the economic relevance of the R&D capital in different financial systems by examining how different firm-specific determinants explain the firm's investments in R&D capital in different financial systems.

At first, we determine the firm's R&D capital, which represents the firm's investments in R&D, and investigate the relative magnitude of the R&D capital by relating it to the difference between the market and book value of equity, i.e. the unrecorded goodwill of

the firm. This provides us with the ratio of R&D capital relative to its unrecorded goodwill which is then compared between different financial systems. Secondly, the economic relevance of the R&D capital in different financial systems is examined by relating the above mentioned ratio to different firm-specific characteristics and comparing these results across different financial systems.

The paper contributes to the literature in three main aspects. First, we compare the estimated R&D capital in different financial systems to see whether a country's financial system in which the firm operates affects the magnitude of the estimated R&D capital. Then, we investigate the significance and relevance of the firm-specific economic determinants on the estimated R&D capital in different financial systems. Finally, we provide international country-specific evidence on this topic and thus contribute to the literature, especially to Ballester *et al.* (2003).

The results of the second essay indicate that the estimated R&D capital, on average, constitutes a great part of the firms' unrecorded goodwill in both financial systems. The estimated proportion of R&D costs that represents investment in R&D capital has a significant role in the constitution of the unrecorded goodwill in both financial systems. The regression results indicate that profitability and growth of the firm are the most important firm-specific determinants that significantly explain the estimated R&D capital of the firm in both financial systems. More specifically, we find that firms with low past profitability and growth make higher investments in R&D capital and vice versa. The impacts of a firm's past profitability and growth on its estimated R&D capital are stronger in the bank-based financial system than in the market-based financial system, which emphasizes the positive role of the bank in financing R&D investments. We also find that size and risk are important determinants of the estimated R&D capital in the market-based financial system, whereas their role is insignificant in the bank-based financial system. Overall results indicate that different firm-specific determinants significantly explain the firm's investment in R&D capital, which therefore stresses the economic relevance of the R&D capital. Moreover, the strength of these associations is determined by the dominating financial system.

### **4.3 Lead-lag structure between the R&D investments and market values in different financial environments (essay III)**

The third essay investigates the stock market's response to R&D investments in different financial systems by taking account of lead-lag structure between the firm's R&D investments and its market values. The lead-lag structure framework is applied because previous studies provide controversial evidence on how and when the accounting information is reflected in the security prices. Past empirical studies indicate that the degree of information disclosures between the firms and its investors may depend on the country's financial environment. They argue that investors are more informed in market-based than bank-based financial systems, which leads to higher certainty of future benefits associated with R&D expenditures in a market-based than bank-based financial system (see e.g. Allen & Gale (1999), Ali & Hwang (2000) and Booth *et al.* (2005)).

The purpose of this essay is to examine whether the financial systems, with their different information environments and disclosure policies, affect the valuation of R&D investments. The study follows the method created by Collins & Kothari (1989) who first point out the importance of taking into account the lead-lag structure between the earnings and returns when measuring the returns-earnings association. We examine whether the leading period market values are more strongly associated with current R&D investments in market-based financial system where the information environment is expected to be richer than in bank-based financial system where only limited amount of information is available to investors. We also investigate whether the contemporary or lagging period market values are more strongly associated with current R&D investments in bank-based financial system, where information is expected to be reflected in prices only gradually over time, than in market-based financial system, where the price reaction is expected to be more timely-basis.

This study contributes the current literature in the following aspects. First, we expand the practices of past ERC studies by taking account into the lead-lag structure between the R&D investments and market values. We then investigate how the country's financial system affect the valuation of R&D investments and how the strength of this valuation depends on the time period where the market response is measured. Finally, we investigate the long-term stock markets' response to R&D investments in different financial systems.

The results of the third essay indicate that the stock market response to R&D investments vary between different financial systems with regards to when the stock market response is examined. More precisely we find that leading period market values are more strongly associated with current R&D investments in market-based than in bank-based financial systems. Investors recognize the value of R&D earlier in market-based than in bank-based financial system, because they have more and timelier information to be used for valuation purposes. Moreover, in bank-based financial systems, the valuation effects remain stable across different time periods, which emphasizes that information is reflected in market values gradually over time. In bank-based financial systems most of the exchange of information is carried out between the firm and bank. Thus, the availability of information to investors is not as important in bank-based as it is in market-based financial system. Finally we describe the positive stock market responses towards current R&D investments that will be continued for several years in both financial systems.

#### **4.4 R&D investments: The effects of different financial environments on firm profitability (essay IV)**

The fourth essay investigates the effect's of a country's financial system on current R&D investments and the future profitability of the firm. Previous empirical literature indicates that different financial environments affect valuation of R&D investments differently. It has been reported that more R&D expenditures are valued in market-based than in bank-based financial systems. When determining factors behind these valuation effects, it is

relevant to examine how R&D investments and future profitability are associated in different financial systems.

The purpose of this essay is to investigate the association between current R&D investments and the firms' future profitability in different financial environments. Furthermore, this essay will determine whether this relationship can be used to explain the valuation differences of R&D spending between market-based and bank-based financial systems. More precisely, we examine whether these valuation differences between market-based and bank-based financial systems are due to the link between the R&D investments and future profitability of the firm or the information asymmetry between the firm and its investors.

This study contributes to the current literature in the following ways. First we contribute to the study by Booth *et al.* (2006), who examine the role of financial environment in the market valuation of R&D spending. They suggest that valuation differences of R&D between market-based and bank-based financial systems are based on the information asymmetry between the firm and its investors. However, as a possible explanation of these valuation differences, they did not examine how R&D investments and future profitability are associated. This study examines the mediating effects of financial systems on the future profitability of the firm's R&D investments and thus tries to seek an explanation for the R&D valuation differences. Subsequently, we expand the study of Kothari *et al.* (2002) by examining how multinational issues such as the country's financial system can explain the relationship between the R&D investments and uncertainty of future firm profitability.

The results of the fourth essay indicate that R&D investments have positive impacts on the level of future firm profitability, and these effects are stronger in bank-based- than market-based financial systems. Our result supports the findings of Booth *et al.* (2006), indicating that differences in the valuation of R&D between market-based and bank-based financial systems mainly depend on the information asymmetry between the firm and its investors. In fact, our results propose an opposite requirement that more R&D expenses should be valued in countries with a bank-oriented financial system.

We also find that the effects of the firm's current R&D investments on the uncertainty of future firm profitability and future price-to-book ratio of the firm are significantly stronger in market-based than bank-based financial systems. These results suggest that multinational valuation differences do not depend on how the uncertainty of future benefits associated with R&D is taken account in the valuation of R&D. Overall results indicate that it is rather the information asymmetry between the firm and its investors than differences in the association between the R&D investments and future firm profitability which cause the valuation differences of R&D spending between market-based and bank-based financial systems. All of our results remain robust even after controlling for the numerous firm-specific factors affecting the firm's future profitability.

## References

- Al-Horani A, Pope PF & Stark AW (2003) Research and development activity and expected returns in the United Kingdom. *European Finance Review* 7: 27-46.
- Ali A & Hwang L (2000) Country-specific factors related to financial reporting and the value relevance of accounting data. *Journal of Accounting Research* 38: 1-21.
- Allen F & Gale D (1995) A Welfare comparison of intermediaries and financial markets in Germany and the US. *European Economic Review* 39: 179-209.
- Allen F & Gale D (1999) Diversity of opinion and financing of new technologies. *Journal of Financial Intermediation* 8:68-89.
- Amir E & Lev B (1996) Value-relevance of non-financial information: the wireless communications industry. *Journal of Accounting and Economics* 22: 3-30.
- Amir E, Guan Y & Livne G (2004) The association between the uncertainty of future economic benefits and current R&D and capital expenditures: An industry analysis. Working Paper, London Business School.
- Ball R & Brown P (1968) An empirical evaluation of accounting income numbers. *Journal of Accounting Research* 6: 159-177.
- Ball R, Kothari S & Shanken J (2000) The effect of institutional factors on properties of accounting earnings. *Journal of Accounting and Economics* 29: 1-51.
- Ballester M, Livnat J & Sinha N (1998) Labor costs and investments in human capital. Manuscript.
- Ballester M, Carcia-Ayuso M & Livnat J (2003) The economic value of the R&D intangible asset. *European Accounting Review* 12: 605-633.
- Beaver W (1968) The information content of annual earnings announcements. *Journal of Accounting Research Supplement* 6: 67-92.
- Beaver W, Lambert R & Ryan S (1980) The information content of security prices. *Journal of Accounting and Economics* 2: 3-28.
- Beck T & Levine R (2000) Industry growth and capital allocation: Does having a market- or bank-based system matter? *Journal of Financial Economics* 64: 147-180.
- Beck T, Levine R & Loayza N (2000) Finance and the sources of growth. *Journal of Financial Economics* 58: 261-300.
- Boot AWA & Thakor AV (1997) Financial system architecture. *The Review of Financial Studies* 10: 693-733.
- Booth GG, Junttila J, Kallunki J-P, Sahlstrom P & Rahiala M (2006) How does the financial environment affect the stock market valuation of R&D spending? *Journal of Financial Intermediation* 15:197-214.

- Bublitz B & Ettredge M (1989) The information in discretionary outlays: advertising, research and development. *The Accounting Review* 64: 108-124.
- Cañibano L, Covarsí MG-A & Sánchez MP (1999) The value relevance and managerial implications of intangibles: Literature Review. One of the deliverables of the MERITUM project, financed by the TSER program of the European Union, 1-74.
- Cable JR (1985) Capital market information and industrial performance. The role of West German banks. *Economic Journal* 95: 118-132.
- Chang J (1998) The decline in the value relevance of earnings and book values. Working paper, Harvard University.
- Chan SH, Martin JD & Kensinger JW (1990) Corporate research and development expenditures and share value. *Journal of Financial Economics* 26: 255-276.
- Chan LKC, Lakonishok J & Sougiannis T (2001) The stock market valuation of research and development expenditures. *Journal of Finance* LVI: 2431-2456.
- Chambers D, Jennings R & Thompson RB II (2000) Evidence on the usefulness of capitalizing and amortizing research and development Costs. University of Illinois at Champaign-Urbana. Working Paper, 1-37.
- Chambers D, Jennings R & Thompson RB II (2002) Excess returns to R&D-intensive firms. *Review of Accounting Studies* 7: 133-158.
- Collins DW, Maydew EL & Weiss IS (1997) Changes in the value-relevance of earnings and book values over the past forty years. *Journal of Accounting and Economics* 24: 39-67.
- Collins D & Kothari S (1989) An analysis of inter-temporal and cross-sectional determinants of earnings response coefficients. *Journal of Accounting and Economics* 11: 143-181.
- Collins D, Kothari S, Shanken J & Sloan R (1994) Lack of timeliness versus noise as explanations for low contemporaneous return-earnings association. *Journal of Accounting and Economics* 18: 289-324.
- Daniel K & Titman S (2001) Market reactions to tangible and intangible information. Working Paper, Northwestern University.
- Demers E & Lev B (2001) A rude awakening: internet shakeout in 2000. *Review of Accounting Studies* 6: 331-359.
- Demirgüç-Kunt A & Maksimovic V (2002) Funding growth in bank-based and market-based financial systems: Evidence from firm-level data. *Journal of Financial Economics* 65: 337-363.
- Demirgüç-Kunt A & Levine R (2004) Financial structure and economic growth: Cross-country comparisons of banks, markets and development. MIT Press, Cambridge, MA; 143-188.
- Diamond D (1984) Financial intermediation and delegated monitoring. *Review of Economic Studies* 51: 393-414.
- Doukas J & Switzer L (1992) The stock market's view of R&D spending and market concentration. *Journal of Economics and Business* 44: 95-114.
- Douthett Jr. EB, Duchac JE, Haw I & Lim SC (2003) Differential levels of disclosure and the earnings-return association: Evidence from foreign registrants in the United States. *The International Journal of Accounting* 38: 145-162.
- Eberhart AC, Maxwell WF & Siddique AR (2004) An examination of long-term abnormal stock returns and operating performance following R&D increases. *The Journal of Finance* LIX: 623-649.
- Easton PD, Harris TS & Ohlson JA (1992) Aggregate accounting earnings can explain most of security returns. *Journal of Accounting and Economics* 15: 119-142.
- Fama EF & French KR (1993) Common risk factors in the returns on stock and bonds. *Journal of Financial Economics* 33: 3-56.
- Francis J & Schipper K (1996) Have financial statement lost their relevance? Working Paper, University of Chicago.

- Healy PM, Myers SC & Howe CD (2002) R&D accounting and the tradeoff between relevance and objectivity. *Journal of Accounting Research* 40: 677-710.
- Hoegh-Krohn NEJ & Knivsflå KJ (2000) Accounting for intangible assets in Scandinavia, the UK, the US, and by the IASC: Challenges and a solution. *The International Journal of Accounting* 35: 243-265.
- Jose ML, Nichols LM & Stevens JL (1986) Contributions of diversification, promotion and R&D to the value of multiproduct firms: A Tobin's Q approach. *Financial Management* 15: 33-42.
- Junttila J, Kallunki J-P, Kärjä A & Martikainen M (2005) Stock market response to analysts' perceptions and earnings in a technology-intensive environment, *International Review of Financial Analysis* 14: 77-92.
- King R & Levine R (1993 a) Finance and growth. Schumpeter might be right. *Quarterly Journal of Economics* 108: 717-738.
- King R & Levine R (1993 b) Finance, entrepreneurship, and growth: Theory and evidence. *Journal of Monetary Economics* 32: 513-542
- Kothari S & Zimmermann J (1995) Price and return models. *Journal of Accounting and Economics* 20: 155-192.
- Kothari SP (1992) Price-Earnings Regressions in the presence of prices leading earnings: Earnings level versus change specifications and alternative deflators. *Journal of Accounting and Economics* 15: 173-202.
- Kothari SP & Sloan RG (1992) Information in prices about future earnings: implications for earnings response coefficients. *Journal of Accounting and Economics* 15: 143-171.
- Kothari SP, Laquerre TE & Leone AJ (2002) Capitalization versus expensing: evidence on the uncertainty of future earnings from capital expenditures versus R&D outlays. *Review of Accounting Studies* 7: 355-382.
- La Porta R, Lopez-de-Silanes F, Shleifer A & Vishny RW (1997) Legal determinants of external finance. *Journal of Finance* 52: 1131-1150.
- La Porta R, Lopez-de-Silanes F, Shleifer A & Vishny RW (1998) Law and finance. *Journal of Political Economy* 106: 1113-1155
- La Porta R, Lopez-de-Silanes F, Shleifer A & Vishny RW (2002) Government ownership of commercial banks. *Journal of Finance* 57: 265-301.
- Lev B & Sougiannis T (1996) The Capitalization, amortization and value-relevance of R&D. *Journal of Accounting and Economics* 21: 107-138.
- Lev B & Sougiannis T (1999) Penetrating the book-to-market black box: The R&D effect. *Journal of Business, Finance and Accounting* 26: 419-449.
- Lev B & Zarowin P (1999) The boundaries of financial reporting and how to extend them. *Journal of Accounting Research* (Autumn): 353-385.
- Levine R (2000) Bank-based or market-based financial system: Which is better? Working Paper, University of Minnesota.
- Levine R & Zervos S (1998) Stock markets, banks, and economic growth. *The American Economic Review* 88: 537-558.
- Loudder ML & Behn BK (1995) Alternative income determination rules and earnings usefulness: the case of R&D costs. *Contemporary Accounting Research* 12: 185-205.
- Monahan S (1999) Conservatism, growth and the role of accounting numbers in the equity valuation process. Working Paper, 1-63. The University of Chicago.
- Morck R & Nakamura M (1999) Banks and corporate control in Japan. *Journal of Finance* 54: 319-340.
- Morck R, Schleifer A and Vishny RW (1988) Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics* 1: 293-315.
- Morck R and Young B (1991) Why investors value multinationality. *Journal of Business* April: 165-187.

- Penman SH & Zhang X-J (2002) Accounting conservatism, the quality of earnings and stock returns. *The Accounting Review* 77: 237-264.
- Sougiannis T (1994) The accounting based valuation of corporate R&D. *The Accounting Review* 66: 1-21.
- Weinstein DE & Yafeh Y (1998) On the costs of a bank-centered financial system: Evidence from the changing main bank relations in Japan. *Journal of Finance* 53: 635-672.
- Woolridge JR (1988) Competitive decline and corporate restructuring: Is a myopic stock market to blame? *Journal of Applied Corporate Finance* 1: 26-36.
- Wurgler J (2000) Financial markets and capital allocation. *Journal of Financial Economics* 58: 187-214.
- Yosha O (1995) Information disclosure costs and the choice of financing source. *Journal of Financial Intermediation* 4: 3-20.



## Original Articles

- I Kallunki, J-P, Karjalainen P & Martikainen M (2005) Investments in Human Capital in different Institutional Environments. *Advances in International Accounting* 18:121-140.
- II Karjalainen P (2007) Economic Relevance and Determinants of R&D Capital in Different Financial Systems. *International Journal of Accounting, Auditing and Performance Evaluation* 4:1-30
- III Karjalainen P (2006) Lead-Lag Structure between the R&D Investments and Market Values in different Financial Environments. Manuscript.
- IV Karjalainen P (2007) R&D Investments: The Effects of different Financial Environments on Firm Profitability. *Journal of Multinational Financial Management* (accepted for publication).

I acknowledge the Elsevier for the permission to reprint the essay I in its original format, published in *Advances in International Accounting*, 2005, 18:121-140.

I acknowledge the Inderscience Publishers for the permission to reprint the essay II in its original format, published in *International Journal of Accounting, Auditing and Performance Evaluation*, 2007, 4: 1-30.

Original publications are not included in the electronic version of the dissertation.



ACTA UNIVERSITATIS OULUENSIS  
SERIES G OECONOMICA

13. Ulkuniemi, Pauliina (2003) Purchasing software components at the dawn of market
14. Kytönen, Erkki (2004) Cash management behavior of firms and its structural change in an emerging money market
15. Peltoniemi, Janne (2004) The value of relationship banking. Empirical evidence on small business financing in Finnish credit markets
16. Helander, Nina (2004) Value-creating networks: an analysis of the software component business
17. Nätti, Satu (2005) Customer-related knowledge utilisation in the collaborative relationships of professional service organisation
18. Juutinen, Artti (2005) Biodiversity conservation in forestry: essays on the economics of site selection
19. Korhonen, Marko (2005) Nonlinearities in exchange rate: evidence from smooth transition regression model
20. Järvinen, Janne (2005) Rationale for adopting activity-based costing in hospitals. Three longitudinal case studies
21. Pekkarinen, Saara (2005) Economic analysis of travelling. Studies on travel behaviour in Finland
22. Holma, Heikki (2006) Supply chain management and industry cyclicity. A study of the Finnish sawmill industry
23. Lähteenmäki, Ilkka (2006) The development of the Finnish banking industry from a partnership perspective
24. Salo, Jari (2006) Business relationship digitalization. A case study from the steel processing industry
25. Kortela, Heli (2006) The predictive power of financial markets. Essays on the relationship between the stock market and real economic activity
26. Silvola, Hanna (2007) Management accounting and control systems used by R&D intensive firms in different organizational life-cycle stages
27. Simonen, Jaakko (2007) The effects of R&D cooperation and labour mobility on innovation
28. Kyröläinen, Petri (2007) Essays on investor behavior and trading activity

Book orders:  
OULU UNIVERSITY PRESS  
P.O. Box 8200, FI-90014  
University of Oulu, Finland

Distributed by  
OULU UNIVERSITY LIBRARY  
P.O. Box 7500, FI-90014  
University of Oulu, Finland

S E R I E S E D I T O R S

**A**  
**SCIENTIAE RERUM NATURALIUM**  
*Professor Mikko Siponen*

**B**  
**HUMANIORA**  
*Professor Harri Mantila*

**C**  
**TECHNICA**  
*Professor Juha Kostamovaara*

**D**  
**MEDICA**  
*Professor Olli Vuolteenaho*

**E**  
**SCIENTIAE RERUM SOCIALIUM**  
*Senior Assistant Timo Latomaa*

**E**  
**SCRIPTA ACADEMICA**  
*Communications Officer Elna Stjerna*

**G**  
**OECONOMICA**  
*Senior Lecturer Seppo Eriksson*

**EDITOR IN CHIEF**  
*Professor Olli Vuolteenaho*

**EDITORIAL SECRETARY**  
*Publications Editor Kirsti Nurkkala*

ISBN 978-951-42-8439-7 (Paperback)

ISBN 978-951-42-8440-3 (PDF)

ISSN 1455-2647 (Print)

ISSN 1796-2269 (Online)

